Rock Products

TRADEPRESS PUBLISHING CORPORATION
542 SOUTH DEARBORN STREET
CHICAGO

NATHAN C. ROCKWOOD, Editor CHAS. H. FULLER, Manager C. F. TREFZ, Associate Editor

Vol. XXIII, No. 10 May 8, 1920

Circulation 5300 copies, net

Applicant for membership in Audit Bureau of Circulation

Second class entry at U. S. Post Office.

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PUBLISHED EVERY OTHER SATURDAY by the Tradepress Publishing Corporation, 542 South Dearborn St., Chicago, Ill., U. S. A. W. D. Callender, president; T. J. Sullivan, vice-president; George P. Miller, Treas.; C. H. Fuller, Secy.

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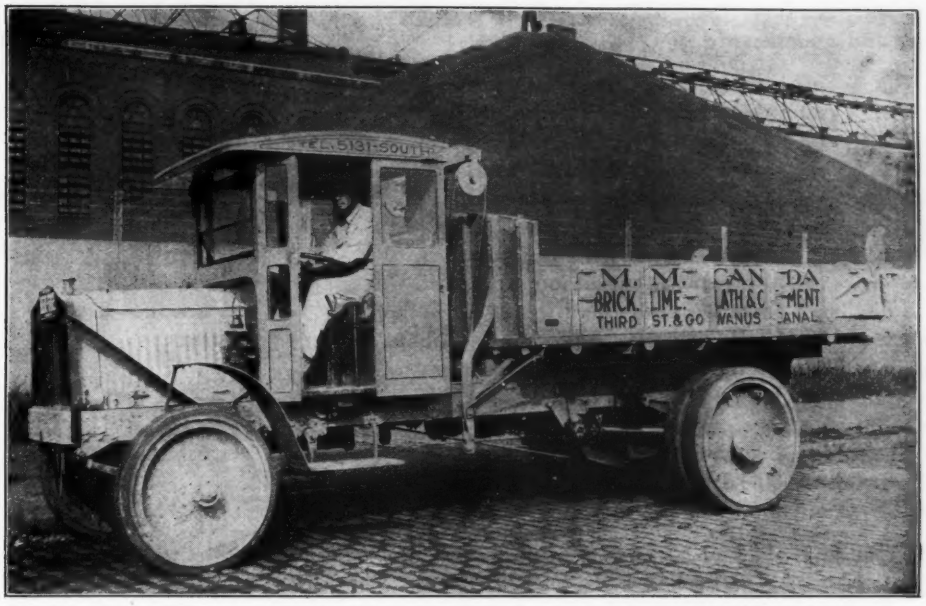

Packard Truck delivering Building Materials. The growing preference in the building trades for the Packard is a matter of economy over a term of years as compared with the deceptive low first cost of the average assembled truck.

Can the Building Supply Dealer Further Lower His Costs

IN no other industry does the right choice of a truck produce such substantial savings as in the building supply business. That is the reason the far-sighted Building Supply Dealer is coming to demand facts and figures on truck performance that will bear the closest scrutiny.

The Packard people do not pretend to authority on any subject except *transportation*. But they *can* show the American business man *records of savings in trucking costs*—10 per cent in gasoline, 18 to 22 per cent in time, up to 30 per cent in ton-mile cost.

They can show him, too, how to apply the same methods to *his own business*.

Packard has done away with the excess costs in gasoline, not only through the remarkable ability of the Packard Truck Engine, but especially by means of the Packard *carbureter*.

Here is a carbureter built especially to stand the vibration of a truck at work. The float feed positive and *precise*. The carbureter water-jacketed and mounted high up on the cylinder *bloc;* so that the gas is warmed by the motor, and fed to the engine ready to flash into power.

Packard does away with excess friction and oil wastage, by the *precise* and positive *alignment* of parts from end to end of transmission.

It saves oil again by the *close fitting* of pistons and rings—and by preventing loss of oil through drip.

It saves tires by *distribution of load*, by the positive and uniform action of the clutch—in fact, by the engineering design of the *whole Packard rear end*.

Dynamometer tests on Packard Trucks show that the Packard delivers 86 per cent of *Engine-power* to the rear wheels on *low gear* and 94 per cent on *high*.

The Building Supply Dealer who applies these facts to his own trucking problems will enjoy a definite increase in profits from his reduced operating costs.

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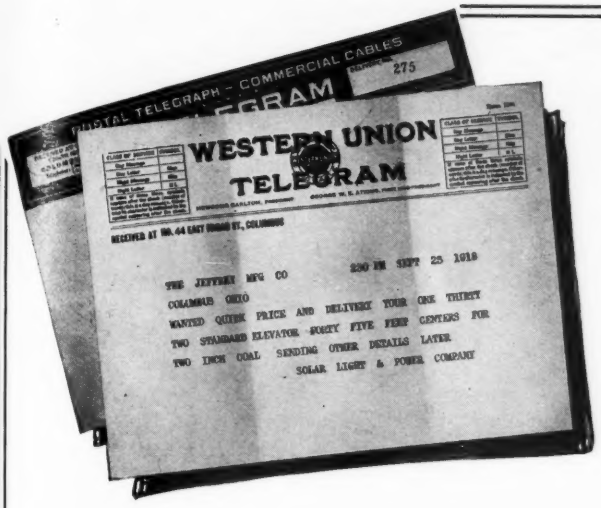

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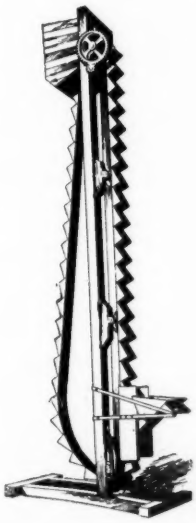

From your Jeffrey Catalog on Standard Bucket Elevators select the number and feet centers, and the information as to price and delivery will be wired back to you at once.

That's the advantage of Standardization. Now from 40 pages of complete layouts and specifications you can select a tried-and-proved elevator to exactly meet your requirements.

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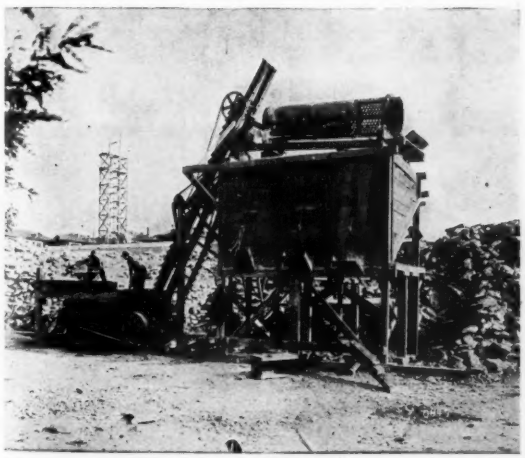
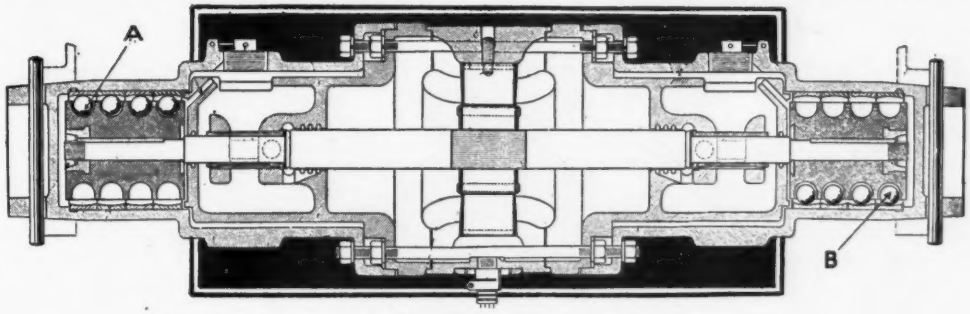
New York, Boston, Scranton, Philadelphia, Pittsburgh, Cleveland, Charleston, W. Va., Chicago, St. Louis, Milwaukee, Birmingham, Dallas, Detroit, Montreal, Seattle, Denver



Road building outfit showing Jeffrey Continuous Bucket Elevator, which carries stone from crusher to revolving screen

Portable outfit for loading bins from ground storage, showing Jeffrey Continuous Bucket mounted on a four-wheel traveling truck

The Vibrating Principle of the MITCHELL ELECTRIC VIBRATING SCREEN



U. S. AND FOREIGN PATENTS APPLIED FOR

A MECHANICAL principle by which the meshes of a screen can be forced up into the material **3,600 times a minute** with **an impact of 500 to 1000 pounds,** and yet with absolutely no straining or jarring of the mechanism.

Is a principle of decided interest and importance to every concern operating screens, for it has completely revolutionized screening.

The illustration above is a sketch of the vibrator unit in a Mitchell Electric Vibrating Screen. The outer casing of the mechanism is of tubular form. The large cross-section at the center is the driving motor, through which runs a shaft. At each end of the shaft is keyed a hard fibre cylindrical ball cage, having radial bored holes to contain steel balls (A and B). Encircling the fibre ball cages and pressed tightly into the outer tubular casing are hard steel ball races.

Note in the illustration that the balls in one cage (A) are on top, while the balls in the other cage (B) are on the bottom. In other words, they are 180 degrees apart and are always kept so in operation. Now imagine the shaft rotating. You readily see that centrifugal force throws the balls against the ball races, resulting in an eccentric motion at each end of the shaft. To illustrate that motion, hold a pencil tightly at the middle between the thumb and forefinger of one hand and with the other hand move one end of the pencil in a slightly circular path.

This motion is transmitted to the screen cloth by means of steel arms or plates. The effect is to force the meshes into the material, keeping each mesh following an **upward, circular** path.

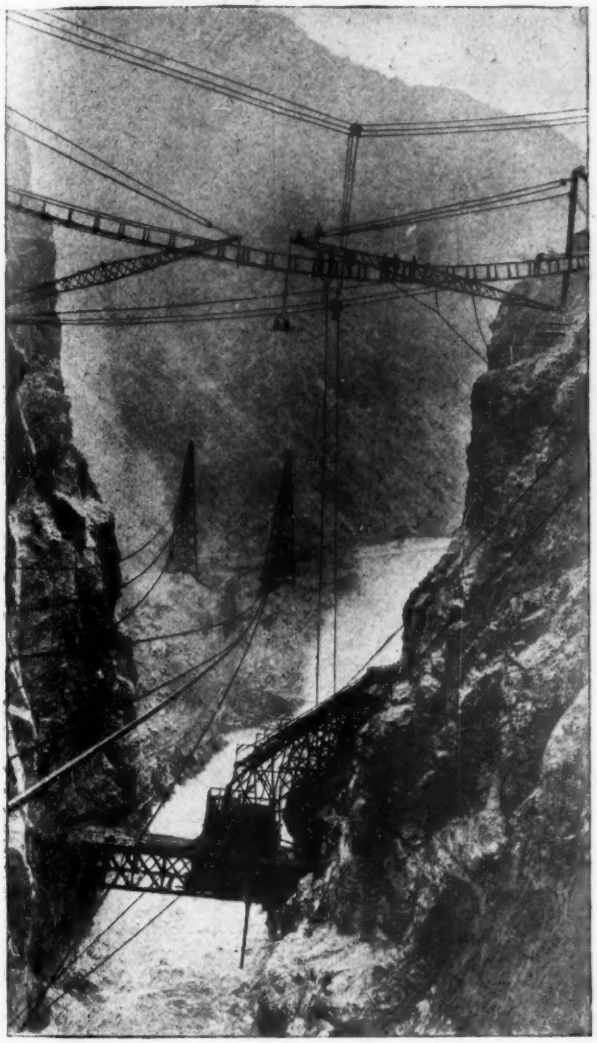
This mechanical principle explains why the Mitchell in 31 rigid tests showed an efficiency of 95 per cent, handling greater tonnage with less current than any other make of screen.

We welcome the most thorough inquiry as to Mitchell construction and performance in the classification of coal, ore, sand, gravel, slag, salt, sugar or any crystalline or granular material.

Stimpson Equipment Co.

315 Felt Building **Salt Lake City, Utah**

Every Variety of Weather; Hard, Constant Strain; For three years the "CROSBY" Clip stood 'em both



MR. CHAS. H. LOCKER, the well known contractor, unhesitatingly named the Shoshone Dam in Wyoming when asked what he considered his most difficult job. To quote Mr. Locker: "That narrow gorge was a terrible place to work in. In winter the snow and the cold and the icy winds made work almost impossible. In the summer there were floods from the melting snow on the mountains, and by way of variety fierce and blinding sand storms."

Here was a real test for all the equipment used, especially the clips that fastened the wire rope.

Genuine "CROSBY" Clips fastened the ropes on cableways, derricks, etc., and a light suspension bridge thrown across the gorge was built of wire rope held together by Genuine "CROSBY" Clips.

In spite of the severity of the working conditions, there was no accident or delay attributable to the "CROSBY" Clips.

No matter where you are, an "AMERICAN" representative can reach you in twenty-four hours.

American Hoist & Derrick Co.

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Builders of "AMERICAN"

Hoisting Engines
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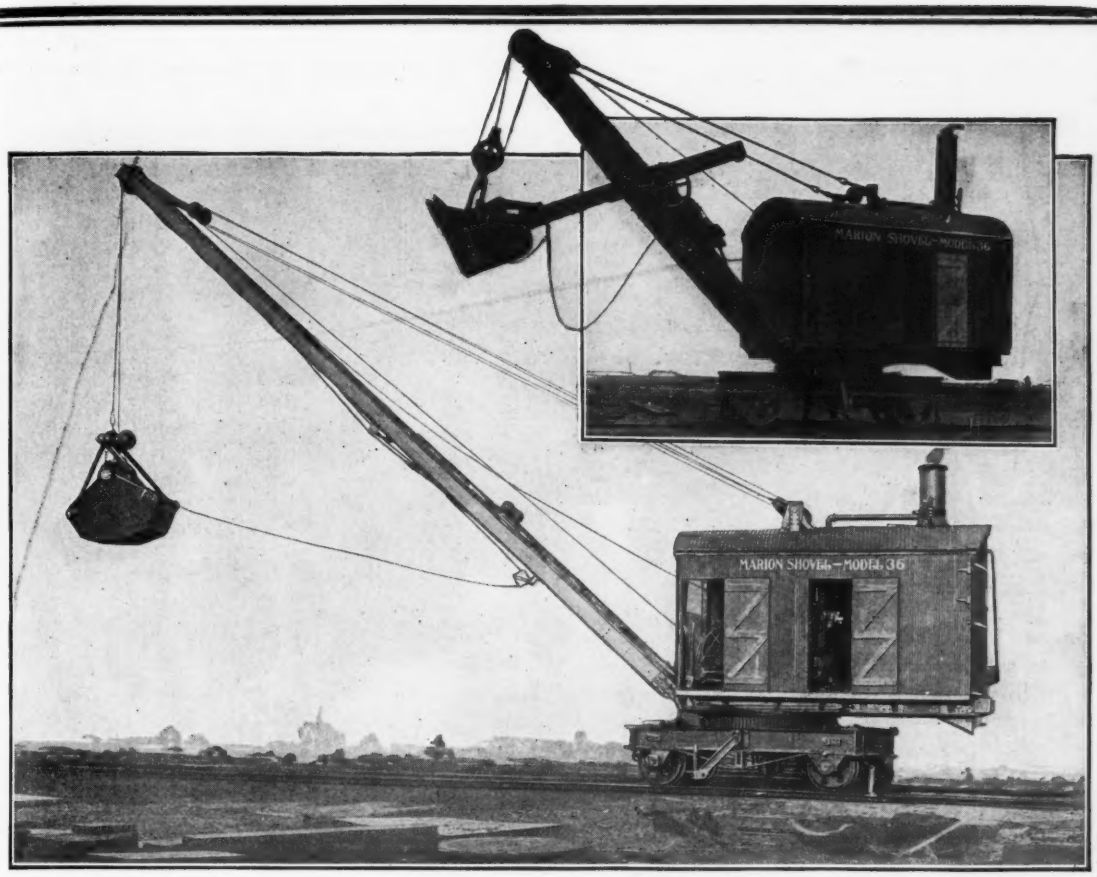

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You can quickly convert your "Marion" Revolving Shovel into a practical locomotive crane, clamshell or dragline excavator. Simply remove the standard boom, dipper and dipper-handle, attach the long skeleton boom and bucket and install a hoisting drum and boom hoist attachment. Units are interchangeable and accurate fitting of each part is assured.

If your work requires a machine with a wide range of action, order your standard Shovel equipped with clamshell, dragline or crane attachments. The extra parts can be fitted to the Shovel before leaving the factory and it will be ready for operation when assembed on the job. The change to the standard Shovel can be readily accomplished at any time.

This ready interchangeability enables "Marions" to render widely-varying classes of service with the same machine.

Our production program, undertaken to meet the big demands for certain Shovels and to insure the best of service to "Marion" customers, is p.oving most satisfactory. It has already increased production and has speeded up deliveries to the direct benefit of every prospective shovel buyer.

Write for detailed information

THE MARION STEAM SHOVEL COMPANY

Established 1884 **Marion, Ohio**

New York *Chicago* *Atlanta* *San Francisco*

Marion

Almost Out of Sight—*but still loading*

HERE the profit-making possibilities of a Browning Crane are graphically shown. Quickly converted into a steam shovel, it has reached a depth at which it would be impossible for an ordinary steam shovel to work. Note how many feet above the top of its own cab it is dumping.

This feature of great adaptability is one of the big reasons why Browning Cranes are used by those who know them. Another reason is the fact that Browning Locomotive Cranes and Browning Buckets are the sole products of the Browning plant. Every energy of every executive, designing engineer and mechanic is directed solely toward the one goal, viz.: the production of the most efficient cranes and buckets it is possible to produce.

To find out how well they have succeeded, write for catalog and production figures on your own lines of work.

THE BROWNING COMPANY, Cleveland, Ohio

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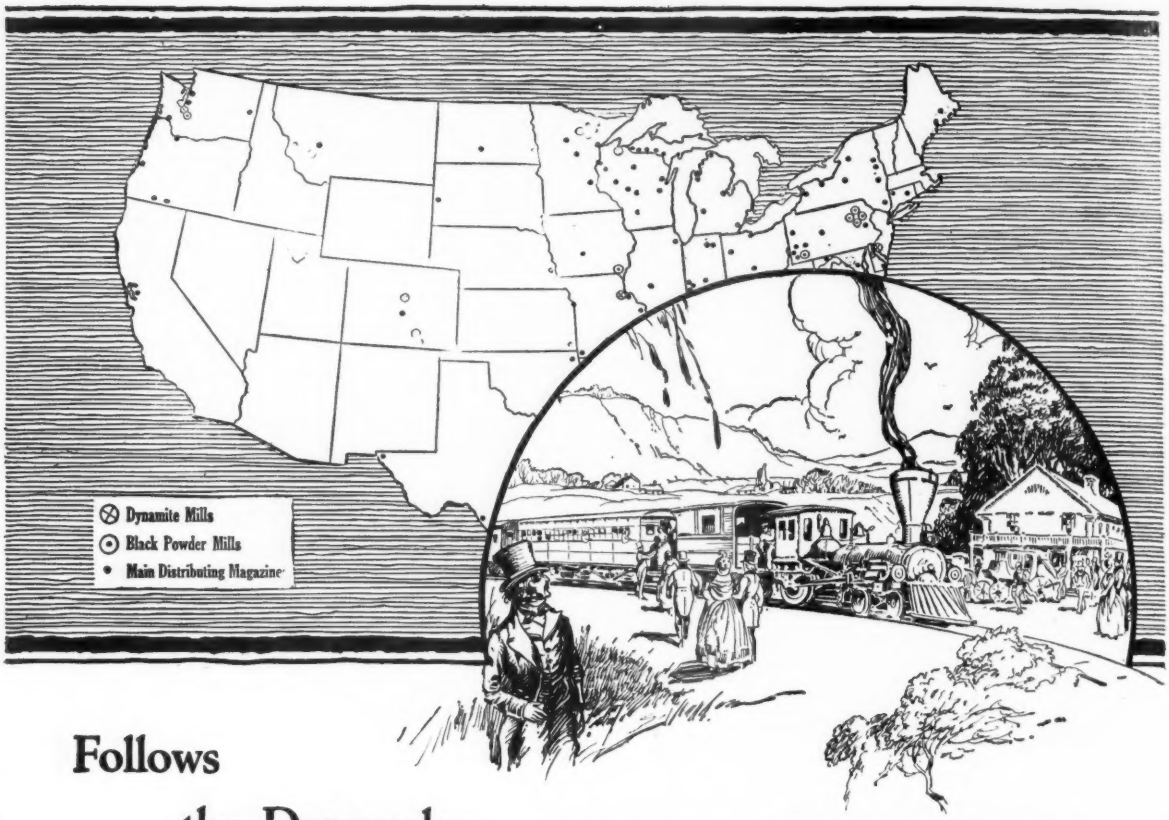
BROWNING
LOCOMOTIVE CRANES

Du Pont Explosives Service —*Everywhere*



Follows the Demand—

In Reconstruction Days

IN Reconstruction Days during the late '60s and early '70s Du Pont Service went westward with the Nation's expansion, helping the first Great Transcontinental Railroads to clear and level their right-of-ways, mining the ore to make their equipment and the coal to run their engines.

The history of the Du Pont Organization has been closely tied up with the safety and industrial welfare of the country since 1802, until now it has come to be the greatest producer of explosives in the world. It operates 24 mills located at strategic points throughout the country together with a great number of magazines. One of these distributing points is near your work and the vast fund of knowledge of explosives we have gathered during the last 118 years is as near to you as your pen.

Tell us the requirements of your work. It is our business to recommend the type of explosive that will handle it most efficiently and at the lowest cost. Bring your difficult problems to us. Du Pont Service is effecting tremendous savings for our customers. It is yours for the asking.

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Sales Dept.: Explosives Division
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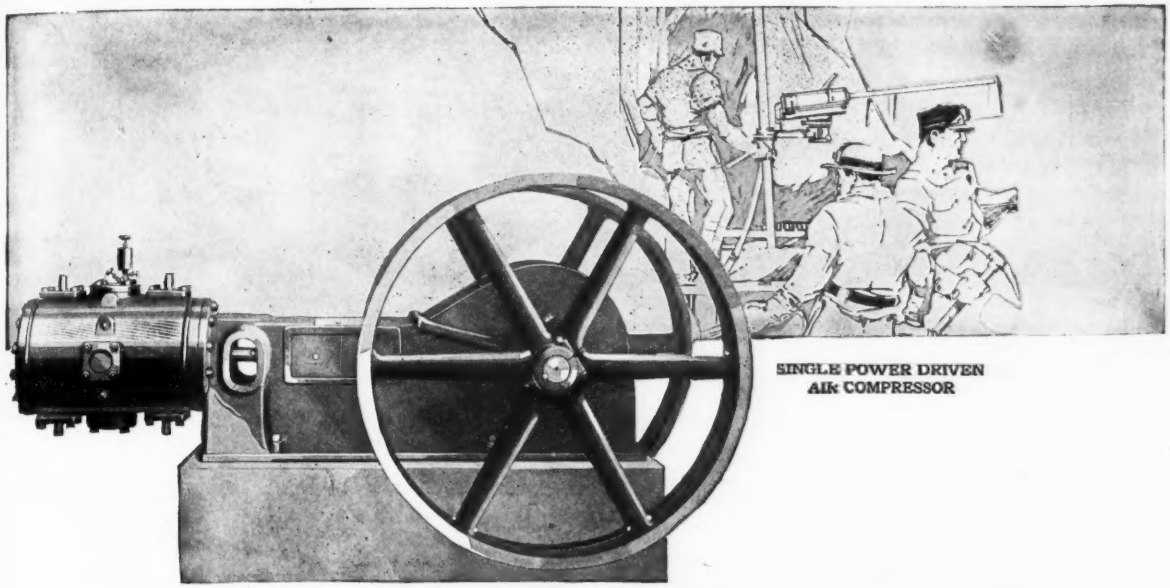

SINGLE POWER DRIVEN
AIR COMPRESSOR

Why Worthington Salesmen Talk "FEATHER" Valve

(REG. U. S. PAT. OFF.)

THEY talk it because it is a distinctive Worthington creation. They talk it because it is the reason why Worthington Air Compressors are enabled to work through long stretches that would knock out the ordinary compressor valve.

This wonderful valve is a strip of ribbon steel that weighs less than one ounce, has but one moving part—itself—and functions without friction or hammering action. The valve strip seats tightly on ground face slotted seat and permits air or gas to pass by flexing against slotted curved guards; then gently straightens into place again. The valve ends are always in contact with seat, both when at rest and in action.

So always remember that Worthington Salesmen are serving your best interests when they sell "FEATHER" (Reg. U. S. Pat. Off.) Valve to you, because it frees air compressor service of a "weak sister" and in so doing saves you much time, nuisance and worry and expense.

And, too, the Worthington engineering staff is always at your service without expense or obligation—an organization with the prestige of 80 years' active business life behind it.

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***Executive Offices:* 115 Broadway, New York City**
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Gas Engine Works, *Cudahy, Wis.*
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Rock Products

Vol. XXIII Chicago, May 8, 1920 No. 10

Lime Hydrate from Marble Waste

Vermarco Lime Company Plant, West Rutland, Vermont, Burns Pulverized Marble in Rotary Kiln

THE ONLY LIME PLANT in America which utilizes the waste of marble quarries is that of the Vermarco Lime Co., a subsidiary of the Vermont Marble Co., whose main office is at Proctor, Vt. The lime plant and some of the quarries are at West Rutland, Vt. A. C. Freeborn is general manager of the lime company.

Quarry Operation

These are probably the largest marble quarries in the world and the lime plant does not begin to utilize all of the waste products. The stone is quarried in immense blocks which are lifted out and deposited on railway cars by derricks. These blocks are laid out in huge stock piles, exactly as rough lumber is piled around a saw mill. When an order is received for a monument, or what not, suitable blocks are selected from stock and cut according to the specification.

The rough blocks are first trimmed approximately to size in the open, which involves the accumulation of great quantities of chips. These in general are not utilized because of the cost of collecting and moving them. The principal source of raw material for the lime plant therefore comes from blocks and slabs broken in the handling or cutting process. These are large enough to be collected and handled by the car load with economy.

Crushing Plant

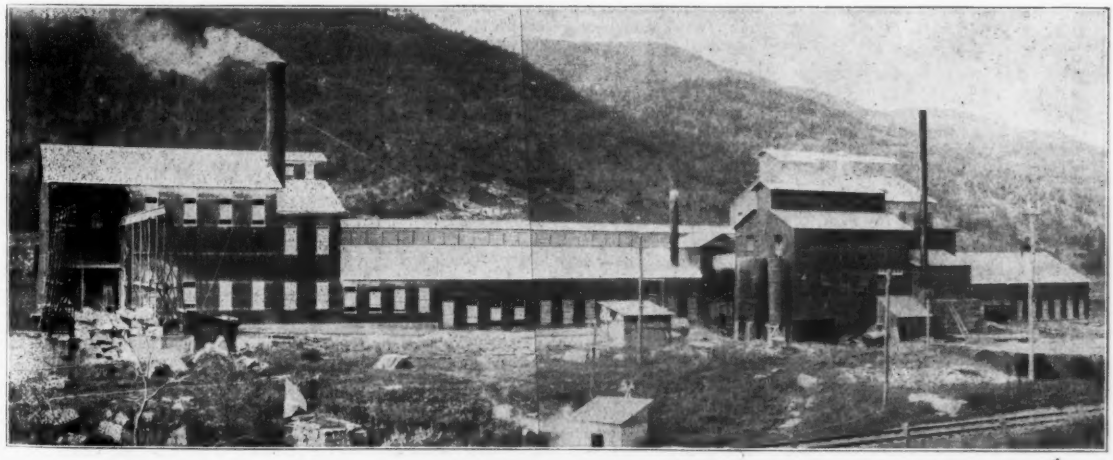
The crushing plant is rather unique and has been found by experience not at all economical to operate. It is at one end of the kiln building, as shown in the view on the first page of this article.

Slabs and blocks of waste marble are brought to the crushing plant on standard-gauge flat cars. These cars are spotted under a traveling crane, the track of which extends into the crusher building and over the primary crusher.

Each block of marble has to be attached by chains to, and lifted individually by, the crane hoist, which drops the stone into a 40x68-in. jaw crusher, mounted on a concrete pedestal foundation 10 or 12 ft. above the ground level. The discharge of this jaw crusher flows down a steel-lined chute into the mouth of a 12-in. gyratory (No. 6), which reduces the jaw-crusher product to 2-in. size and less.

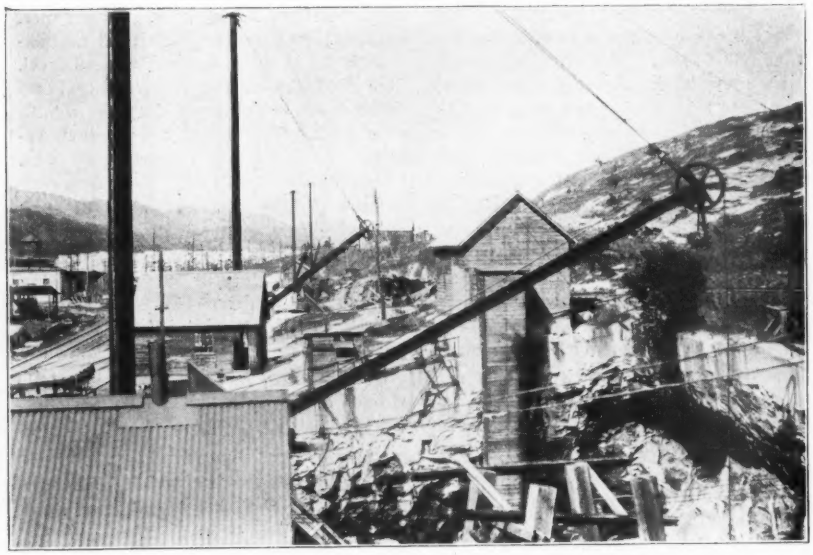
Each crusher has its own individual electric motor, that for the jaw crusher being 150-h.p. and that for the gyratory 50-h.p. The elevator to the scalping screen is also driven by an individual 75-h.p. electric motor. Material under ½-in. in size is removed from the crusher product and sent direct to a pulverizer feeding bin.

The crushed stone rejected by the scalping screen is conveyed to a bin over a 16x36-in. roll crusher, which further reduces it. Originally the product of these rolls went direct into the kiln—about a ¾-in. size and less.

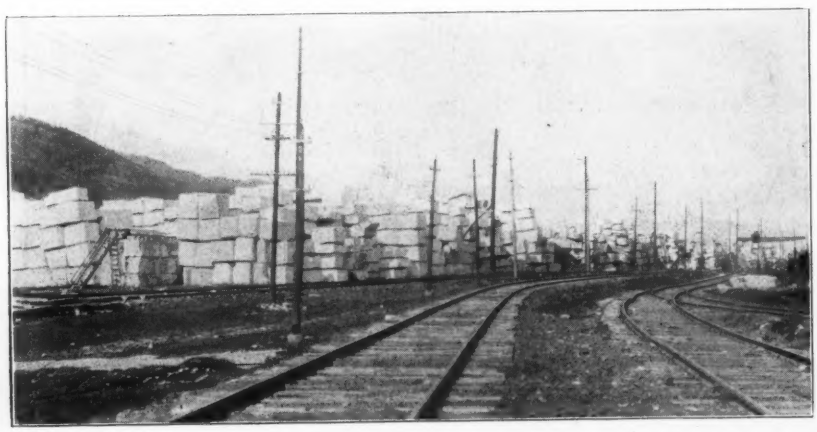


Plant of the Vermarco Lime Co., West Rutland, Vermont

An abandoned quarry working showing dip of the marble and the peculiar cave-line method of quarry opening



Quarry opening showing derricks which lift out the blocks of marble and deposit them on railway cars at the left



Stocks of rough marble blocks piled for future use like lumber in a saw-mill yard

Pulverized Stone Burned

It was found that the unburned stone, when feeding the kiln with ¾-in. size, often amounted to as much as 10 per cent of the kiln output. To overcome this underburning it was decided to pulverize the stone before feeding it to the kiln. Consequently the hammermill pulverizer, shown in one of the views, was added.

The product of the 36-in. rolls is now elevated and conveyed to another steel bin, which feeds the pulverizer. The product of the pulverizer has never been analyzed for fineness but, judging from appearance, it would run at least 50 per cent through 100-mesh and all through a 16-mesh. That is, it is about the consistency of ordinary agricultural limestone dust.

This is the first case on record where the feed of a lime kiln has been reduced to such a degree of fineness, but the results are said to fully justify the care in the preparation of the stone. Not only has the amount of unburned stone in the kiln output been reduced to about 1 per cent, but the capacity of the kiln has been correspondingly increased.

Kiln and Gas Producer

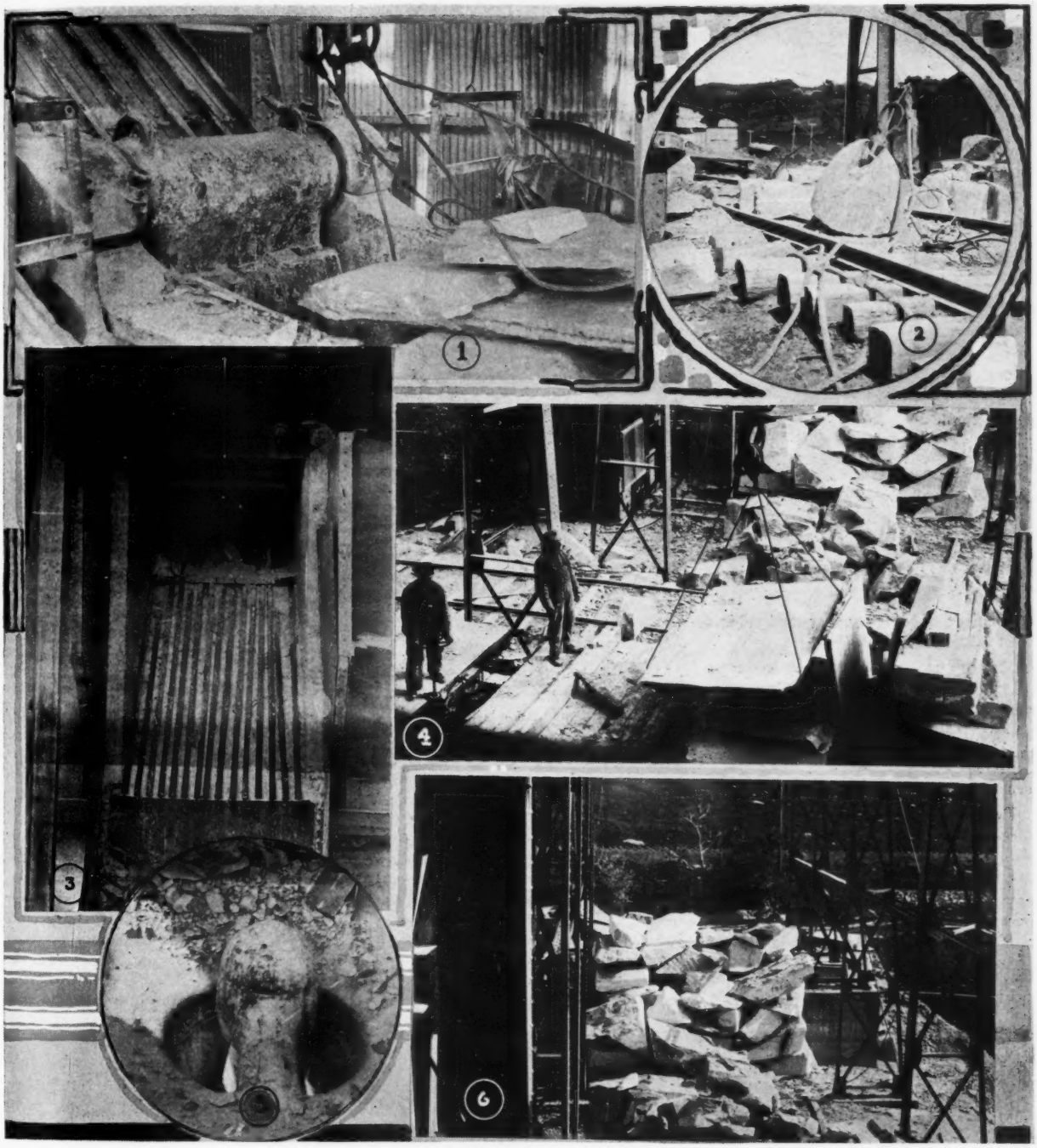
The kiln is of the ordinary, fire-brick lined type, 8 ft. in diameter and 120 ft. long. It has a pitch of about 4 per cent. This kiln is driven by a 30-h.p. variable speed electric motor capable of giving 10 speeds from 0.5 to 1.5 r.p.m. The kiln is operated under normal conditions at about 1 r.p.m.

The kiln is fired by producer gas generated in an adjoining building, which makes it necessary to convey it a distance of 30 or 40 ft., a part of which distance is outdoors. The gas main is of course properly lined with fire brick, but experience has shown that better results would have been obtained if the gas producer had been placed nearer to the kiln.

A temperature of about 2200 deg. F. is maintained in the kiln. The hot gases and dust pass into an expansion chamber at the base of the stack and a considerable part of the dust is recovered and returned to the kiln, but no use is made of the waste heat at the present time.

The kiln operation is checked by a Bristol recording tachometer, as to speed and output, while the quality is recorded by a Truesdell automatic sampler.

The producer gas is made in a 10-ft. Chapman producer using Pennsylvania gas coal. The coal is delivered on the same track which serves the crushing plant in hopper-bottom cars. It is discharged to a conveyor which feeds a coal crusher and is then elevated to a large steel storage bin over the gas producer. The gas producer is fed by gravity from this bin, as shown in one of the views.



(1) Primary jaw crusher, showing character of the marble slabs fed to it; (2) Device for breaking up slabs; (3) Jaw crusher discharge and chute to gyratory re-crusher; (4) Lifting slabs off the flat cars; (5) Gyratory re-crusher; (6) Blocks of marble under crane traveler too large to be conveniently handled by crushing plant

The gas producer is blown with a steam jet which gives a lean gas with a considerable proportion of moisture, and about 50 per cent of nitrogen. A very mellow flame is obtained and the lime is of excellent quality and very clean.

Hydrating Department

The company's specialty is hydrated lime which is sold under the commercial name of "Vermarco Finishing Hydrate." About one-third of the entire output is hydrated. The most of this material is sold to the building trade to be used for finishing coat plaster.

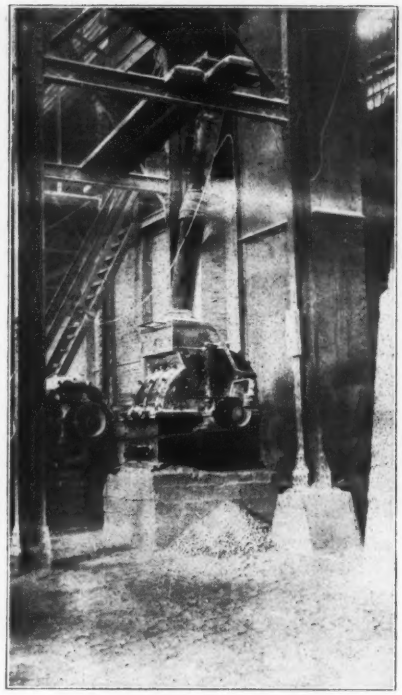
The hot lime from the kiln drops almost directly into a rotary cooler below the kiln and revolving on an axis approximately parallel to the kiln axis.

The heated air from the cooling lime is used for supplying the producer gas flame in the kiln.

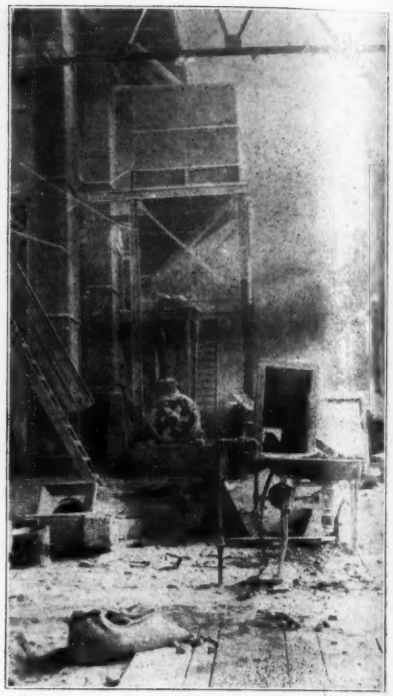
The lime when discharged by the cooler, drops into the pit of a bucket elevator and is conveyed to a large V-bottom steel storage bin over the hydrating machine. Storage for about 60 tons, or one day's run of the kiln, is provided.

From the storage bins the lime is fed automatically into a Kritzer continuous

Automatic feeding hopper and 36-in. crushing rolls



The pulverizer which is used for reducing the kiln feed



Another view of pulverizer showing feeding bin

hydrator. The product of the hydrator is conveyed to another steel bin of about 60 tons capacity, from which it is fed to two Raymond mills and air separators. Canvas tube dust collectors are provided over the mills for the very fine product.

Two grades of hydrate are made and marketed—the ordinary product of the Raymond mills, "Vermarco" hydrate and the very fine material, "Superfine" hydrate. The "Vermarco" hydrate is so fine that only 6 per cent is retained on a 200-mesh, while the fineness of the "Superfine" can hardly be determined. The hydrate is a very fluffy snow-white product and certainly shows no evidence of having come from a crystallized limestone.

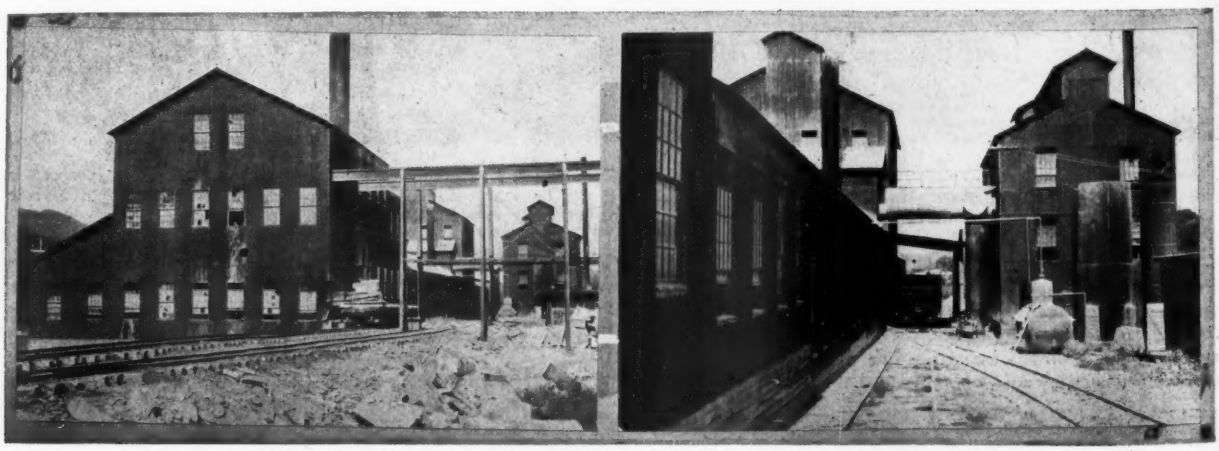
The hydrating plant is under the same roof as the crushing plant and kiln. The crushing plant is partitioned off from the rest of the plant, but the hydrating department and the kiln room are all one and the same.

The machine units of the hydrating plant are driven by individual electric motors, as is the rest of the machinery. The hydrator is operated by a 15-h.p. motor, the two Raymond mills each by a 5-h.p. motor, and the separating fans by 20-h.p. motors.

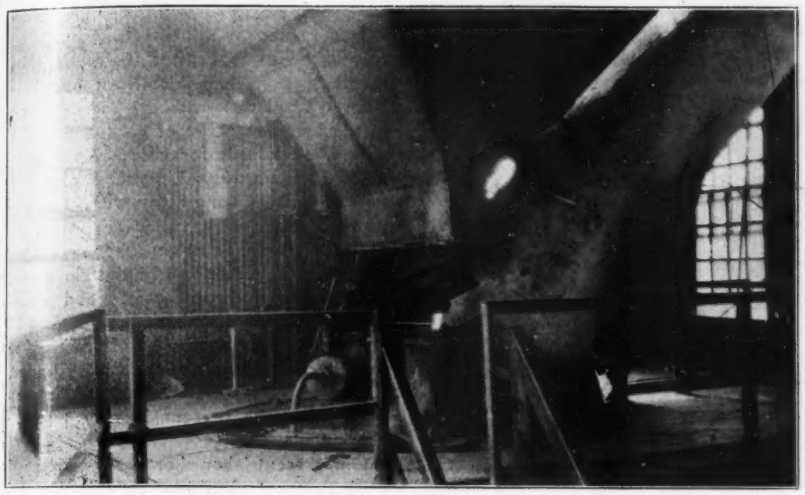
The finished hydrate is shipped both in bags and barrels. A 4-valve Bates bagging machine is mounted near the Raymond mills. This is driven by a 15-h.p. individual electric motor. Beyond the bagging machine is 60 or 70 ft. of clear floor space for storage of bagged and barreled hydrate and for a shipping department. Each side of the shipping room is provided with a railway track.

In addition to the lime plant described the steel-frame building containing the kiln and hydrating plant is provided with benches and small tools so that many minor repairs may be made under the same roof. A large machine shop is of course operated in connection with the marble end of the business.

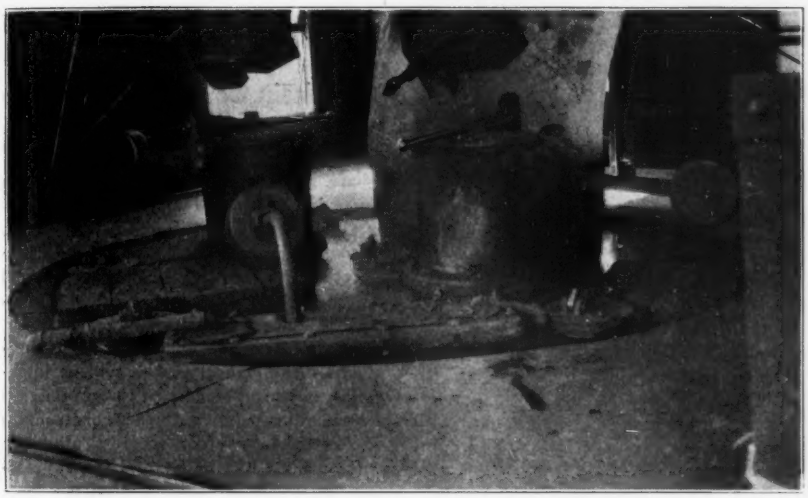
The building is amply wide for a sec-



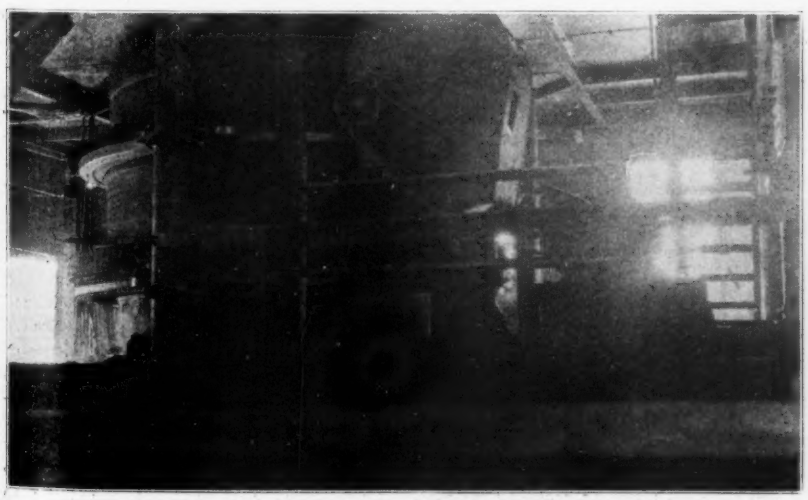
Two views of the steel buildings—kiln plant on the left and gas-producer house on the right



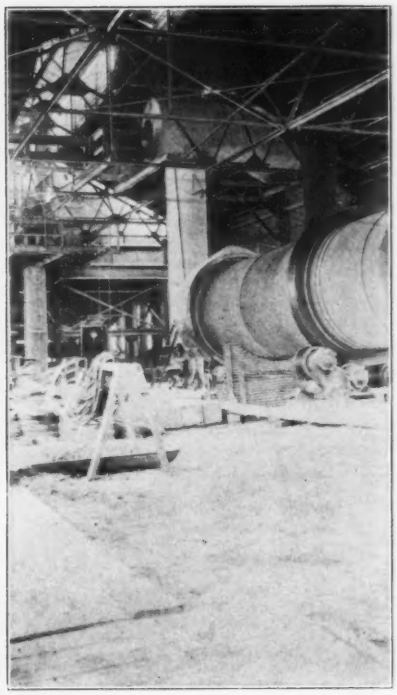
Gas producer showing feed spout and outgoing gas main



Another view of gas producer, showing gates in coal hopper



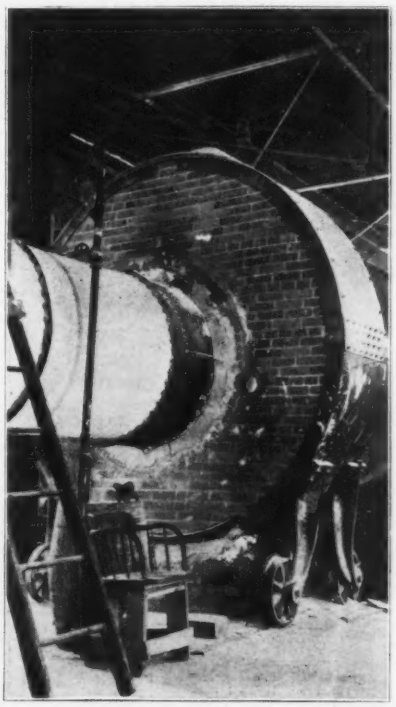
Driving mechanism of gas producer



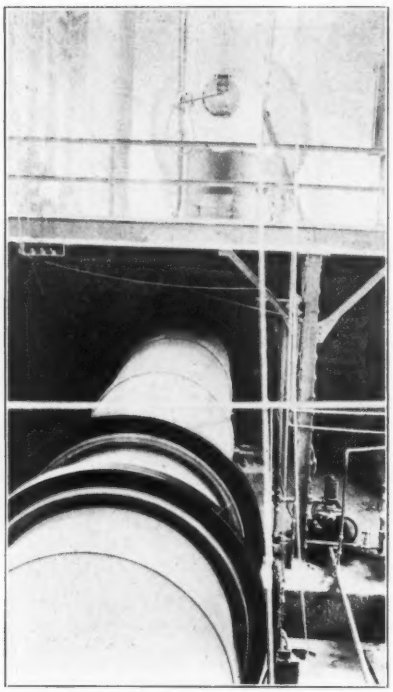
Kiln room showing place for second kiln which may be installed later

ond rotary kiln, and the plant is so designed that its present capacity could be doubled very easily.

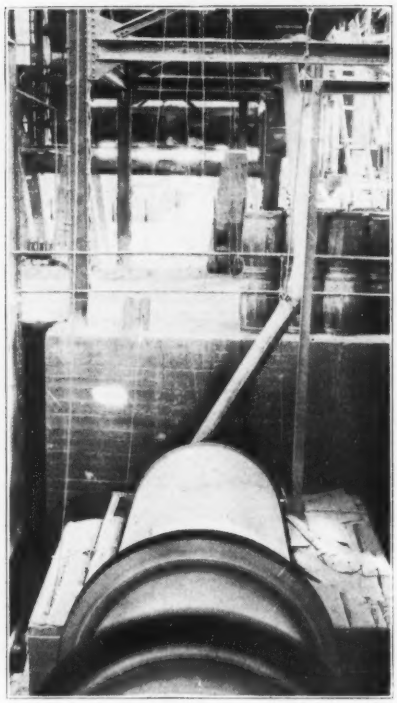
A cooperage shop with a capacity of 500 bbls. per day is operated in connection with the plant. About one-third of



View of the firing end of the kiln, showing hood



A view of the rotary cooler showing the discharge end



Discharge end of rotary cooler showing hydrating plant in background

the product is barreled. "Vermarco Granular Finishing Lime," which is put into barrels holding 280 lbs. net, is also one of the company's large products; part going to the building trade and part to chemical manufacturers. Considerable bulk oxide is also shipped to the paper manufacturers and other chemical companies. The paper manufacturers do purchase a small amount of the hydrated form which they keep on hand as a reserve stock. The tailings are screened and sold as agricultural lime. It tests as 70 per cent calcium oxide.

Proposed Remedies for Labor Shortage

PRACTICAL MEASURES to relieve the present labor shortage were proposed by the National Immigration Conference, held in New York City. This gathering included leaders in finance, industry and agriculture, together with labor men and representatives of foreign-born groups in America, and was called by the Inter-Racial Council.

Among the measures proposed were greater protection for the immigrant against fraud, extortion and violence. A federal assimilation bureau should be established to look after the welfare of the immigrant, help him learn our language and place him where he can work to the best advantage of himself and the nation. Standards for citizenship should be high, but useless hindrances and red tape should be done away with. An advanced immigration policy advocated as a remedy for the present labor shortage, including the selection of industrious and thrifty men and women of good character and their distribution.

As an immigrant may be of great value to the country as an unskilled laborer, regardless of his inability to read, it was urged that the present literacy test be eliminated.

Our present labor shortage is estimated at between 4,000,000 and 5,000,000 and this would be relieved by a policy of admitting immigrants without book learning, but of good character, sound body and mind and the Old World habits of frugality and industry.

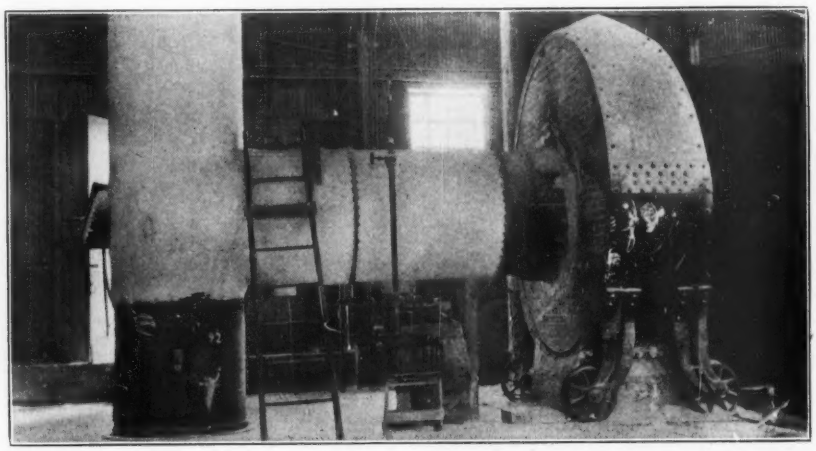
Wisconsin Counties to Operate Local Gravel Pits

SEVERAL COUNTIES in Wisconsin are making arrangements and a few have already started to put in their own local sand and gravel plants. To date, however, this does not seem to have affected any of the Wisconsin Mineral Aggregate Association members' business in those localities.

At the finish of the work to be supplied by these local pits, it will be interesting to learn the cost of the production as well as the cost of the construction of the roads, several projects of which will be built by the State Highway Department.—Wisconsin Mineral Aggregate Association, General Letter.

Chinese Company to Mine Mica

A REPORT has been received from the American consulate at Chungking, China, to the effect that a new company has been organized to operate a mica mine north of Ta-chien-lu, in the province of Ssu-Chuan. The company, which is entirely under Chinese management and control, has a working capital of $10,000. While comparatively new, the mine has been worked before, and apparently with some success. The mica is said to be of good quality. It is claimed that the deposit will supply a limited amount of mica that will cut in pieces of one foot square or over, and larger quantities of smaller sizes. The chief difficulty is transportation, for it is reported that a ten days' journey, part of it over mountain trails, will be necessary to transport the mica from the mine to Yachow, the nearest practical waterway.



Gas main connection with kiln—gas comes down pipe at left after crossing railroad track on side of building between kiln house and gas-producer plant

River Sand and Gravel Operations in the State of Missouri

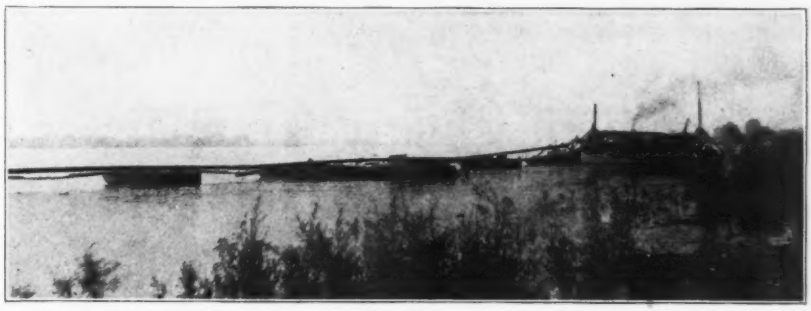
Pumping Is the Favorite Method of Excavation—Some of the Difficulties Encountered in This Method of Operation

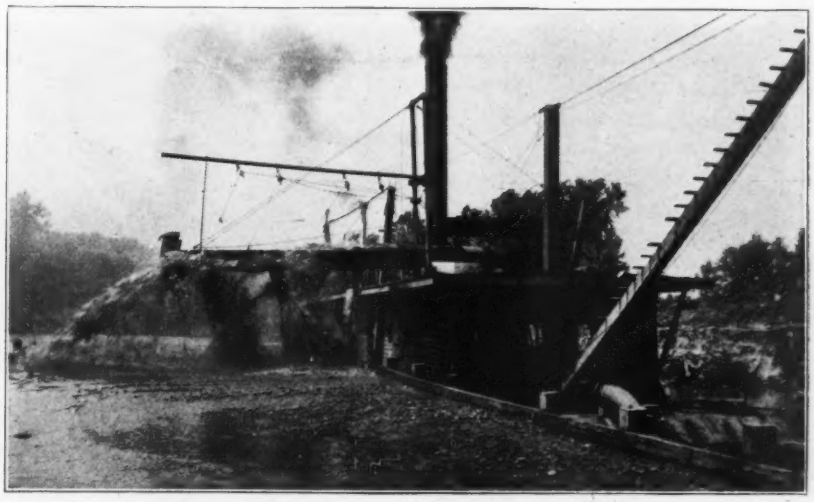
BESIDES THE BIG operations in the St. Louis district, already described in ROCK PRODUCTS there are many river and creek operations in the state's sand and gravel industry. Pumping is a favorite method of excavating the material at these operations.

Some of these are seen on Mississippi River, Missouri River, Black River, Joachim Creek, Meramec River, Gasconade River and Nodaway River. The pumps vary from 4 to 15 in. in interior diameter and under average conditions of pumping are reported to range in capacity from about 40 cu. yds. to 250 cu. yds. per hour.

Numerous difficulties are met in the pumping of sand. One of the greatest is the frequent clogging of the intake with roots and driftwood, which necessitates the slowing down of the speed until the suction is sufficiently reduced to allow the rubbish to drop off the coarse screen over the intake. Sometimes it becomes necessary to raise the intake above the water and pick the roots and fibres out of the screen. This difficulty is most pronounced in small streams, but is scarcely met with by the plants operating on the Mississippi and the Missouri.

Another difficulty is the cutting out by coarse gravel of the steel linings of the pumps. The more powerful pumps have to be relined once in every four to sixthey handle a finer product, are not cut weeks, but the less powerful, becauseout nearly so rapidly as the others.





Example of some of the smaller sand and gravel dredging operations on Missouri streams

Still another difficulty is the inability of the operator to procure sand of the desired size of grain. River bars shift so rapidly, especially where the bottom is disturbed by the pumping operation, that where good coarse sand is being secured one day fine quicksand, quite undesirable as a commercial product, is found the next day. This necessitates sounding with a long iron pipe. An expert sounder can judge the size of grain by the compactness of the bar, as shown in its resistance to penetration by the iron pipe. A frequent moving of the pump is necessary, especially on the Missouri.

Gravel up to a diameter of from 3 to 6 in. can be handled by the larger pumps but it is customary to protect the intake with crossed bars which keep out all material coarser than the largest grade desired in the commercial product.

Pumping can be carried on in water which varies in depth from 1 or 2 up to 20 or 30 ft. About 5 or 6 ft., however, is most convenient, as this depth is sufficient for the floating of the barges and is yet shallow enough not to demand excessive suction.

The greater part of the pumped sand is delivered by the pumps to barges which are towed by steam or gasoline tugs to the landings. In a few instances the barges are merely floated down the river and the full boat returned by drum and cable.

Southern Quarry Company Expands

The Franklin Limestone Company Will Manufacture Agricultural Limestone—Also Starts Operation of Third Plant

ONE OF THE LARGEST and best designed stone crushing plants in central Tennessee is that of the Franklin Limestone Co. at Franklin, Tenn. It was designed for a daily capacity of 600 tons; however, owing to a number of operating conditions, it is found that the best operation is obtained at an average of 350 tons per ten hours.

One of the views gives an idea of the size of the quarry face which has been developed. The upper portion of the face is finely stratified and suitable for agricultural limestone, while the lower part is a good solid stone used for ballast and commercial business.

The stone is loaded by hand, the men being paid according to the amount they load. This is a very common practice in the South, where the laborers are not very steady workers. The men work in pairs and are given a check for each load of stone turned out. At the end of each day the checks in hand tell the earnings of the day and the workers are much better satisfied than when they work on a flat day scale. And, on the other hand, the employers are able to tell just how much the labor for each ton of stone will cost.

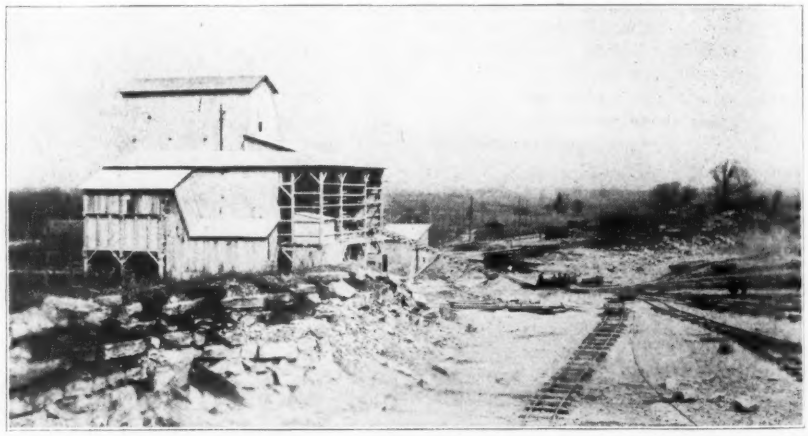
The plant is constructed so as to give a minimum amount of handling of the material and so that the two crushers, a No. 7½ and a No. 5, may be driven by one 125-k.w. motor.

In order that more agricultural limestone may be produced the company is installing a 36x24 hammer-type mill, a vibrating screen and a 35-ton 50 feet center to center elevator. This arrangement will enable the reducing of any size stone to the agricultural product.

In the past the main products were ballast and concrete aggregate, but in the future considerable stress will be laid upon the production of the new material.

The Franklin Limestone Co. also owns a plant at Lewisburg, Tenn., and J. E. Rodes, general manager of the Franklin plant, announces that the company has taken over the operation and sale of output of a plant at Mimmes, Tenn.

With the recent addition to the company the Franklin Limestone Co. will be one of the largest producers in the central Tennessee district. The officers of the company are as follows: J. E. Rodes, president; G. A. Lillie, vice president, and H. E. Rodes, secretary and treasurer.



The Franklin Limestone Co. crushing plant at Franklin

View of quarry, showing track layout

To Increase Finances and Power by Membership Campaign

The Advisory Council of the National Sand and Gravel Producers' Association Will Build Up Association by Active Drive for Members

A TWO-DAY SESSION, including meetings of the Council of Secretaries, Advisory Council and Executive Committee of the National Sand and Gravel Producers Association was held April 29 and 30, at the Sherman Hotel, Chicago. The meetings were highly successful in that seven state and district associations were represented by secretaries and 17 producing states were represented in the advisory council.

The Council of Secretaries, which was created by the last meeting of the National Sand and Gravel Producers' Association, met on the morning of April 29 and decided to organize. This body will work in an advisory capacity to the national association.

It is believed that a strong national association should be partially governed by the state and district secretaries and representatives to the end of developing strong state and district associations, as well as a strong national association. However, there are only nine state or district organizations and there are a number of producers in unorganized states and districts who take an active part in the national association. Because of these producers, the Council of Secretaries will act only in an advisory capacity which will in no way exclude the unorganized districts.

At the meeting of the Advisory Council there were 29 members present, representing 17 states. President V. O. Johnson was chairman, and presided at the meeting. E. Guy Sutton, business manager of the national association showed the remarkable growth of the association spirit.

The national organization was formed only three years ago and has really been active only about 18 months. In that time it has grown to be a real national power and measures up to, and has dealings on an equal with other national trade associations.

Besides having been largely instrumental in the formation of specifications for sand and gravel, the association maintains friendly relations and has exchanged data and worked with strong governmental departments at Washington which are in a position to be of aid to the association.

During the general discussion which followed, the necessity of a strong financial and representative organization was brought to the front. It is the general consensus of opinion that in order to stand up with other strong nationally organized associations and obtain equal rights, the sand and gravel producers will also have to perfect a strong association.

Somehow, the subject of the change of location of the national association headquarters was injected into the discussion and while it was impossible for any action to be taken, the advisability of the change to Chicago was considered. The members who spoke upon the subject seemed to favor a move to Washington in preference to Chicago; it being stated that it is expedient to have the executive office of the association at the seat of operation. It is stated that other large active associations have their representative at Washington at all times. Here, upon the slightest occasion, the representative is able to get after a condition and ride it out of existence before it is able to grow to any great concern. Specific instances of the ineffectiveness of letters and telegrams were cited whereas actual representation does seem to give fruitful results. It is the belief of those in favor of the move to Washington that in order to combat the association now represented at this place and get a fair share of the goods for general distribution that it would be expedient to have a Washington representative.

The railroad situation provoked the most liberal discussion. While all were willing to admit that the carriers are now laboring under unusual conditions, it does seem that the sand and gravel industry has not been proportioned its fair share of open top equipment. The coal operators, according to the experiences of those present, are getting cars which should go to sand and gravel producers.

An interesting example was cited by an eastern producer who told of a certain stone company located near a coal mine and who was shipping when no other mineral aggregate producers could get cars. Investigation showed that there were so many empties delivered to the coal operator that the siding of the stone company had to be used. Conditions developed such that the stone operator had to load some of the empties so that he could switch and so was thus given empties when all others were unable to get them. Instances of coal companies having large numbers of unassigned loaded cars on siding were numerous.

It is stated that a strong national sand and gravel association is desired in order to combat such instances and to enable a better distribution of cars.

The most important decision of the meeting was the working out of a plan to extend the membership of the association and to make it more effective. First and foremost, an association cannot work well without plenty of funds. In order to secure funds without further increase of assessments and in order that the association will truly be a national representative, an active membership campaign will be put under way.

A committee was appointed to work out a way to further this movement. The following is the general outline of the working plan. The membership will be increased by committee work. The central organization will be the Advisory Council, each member of which will be the chairman of a sub-committee of his district to work for new members. It is believed that the movement will be very successful because it makes every present member a working unit to gain new members.

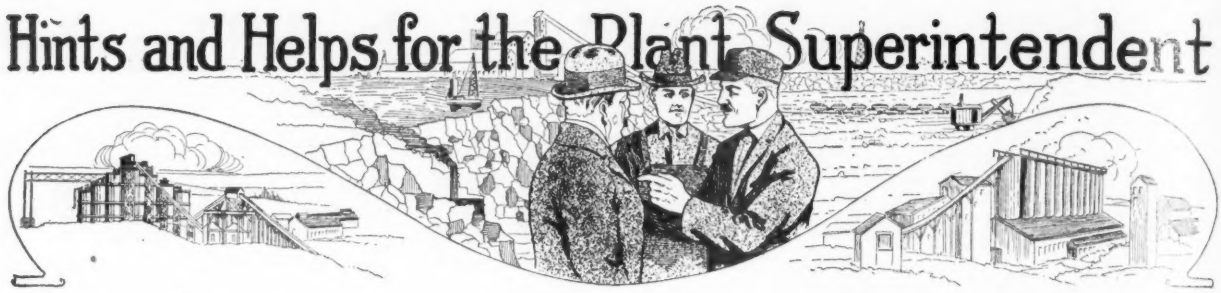
The members of the Advisory Council are, of course, tried association enthusiasts and will very ably and thoroughly conduct the campaign in the various districts.

Headquarters of Illinois Sand and Gravel Producers' Association Moves

AFTER THE COMBINING of the Illinois and the Chicago Sand and Gravel Producers' Associations, the office was moved to Chicago in the office of the old Chicago Sand and Pravel Producers' Association.

Because of the additional work to be done in the office that space was not sufficient and so a new and larger office has been secured at 133 West Washington street, Chicago, Ill., Room 903 of the Chamber of Commerce Building. This building also contains the home offices of a number of large Chicago district sand and gravel producers.

Hints and Helps for the Plant Superintendent



Side Rotating Car Dumper

AN UNUSUAL type of side-dump, car dumper is the one at the plant of the Ladd Lime & Stone Co., Carterville, Ga. It is illustrated herewith. The quarry cars as shown have but three sides—this type of car is quite popular among the southern hand-operated quarries.

A short section of the track at the side of the crusher is pivoted upon a round steel bar several inches in diameter. This pivot bar is placed about four inches off center but the track is so weighted as to remain in a normal position while an unloaded car is on it.

As soon as the loaded car runs onto the dumper, however, a chain and hook is thrown over the side and the section rotates because of the eccentric loading and the stone slides out at the low side When empty, the weight of a man easily rights the section so that the car may be pushed off.

Type of side-dump quarry car used

Side rotated car dumper at the Ladd Lime and Stone Co. plant

Gravity Quarry Track Layout

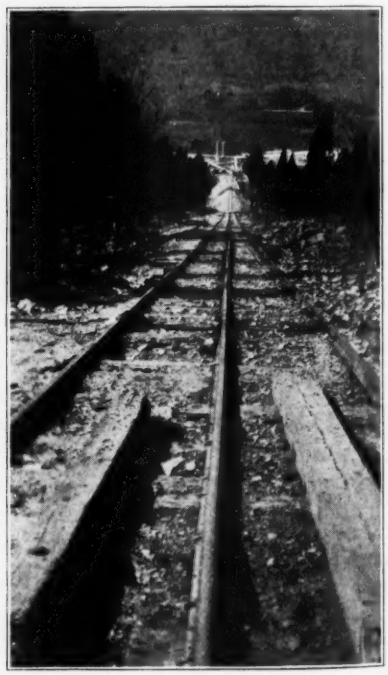
THE ACCOMPANYING view shows the track from the quarry down to the Gager Lime Co. plant at Sherwood, Tenn. The quarry is some 175 ft. above the plant and this feature is made use of by a gravity transportation system from quarry to plant. That is, the loaded car going down to the plant draws the empty car up to the quarry.

The track layout is such that three rails are made to take the place of four.

The cable length being constant, the cars always pass at the same point. A sidetrack and switch at this point enables the cars to pass. The middle rail is used by both the ascending and descending cars as the inside rail, except at the passing switch.

How to Raise a Boom on an Atlantic Type Shovel

EVERY ATLANTIC-TYPE shovel is equipped with a three-sheave block and a two-sheave block and a wire rope



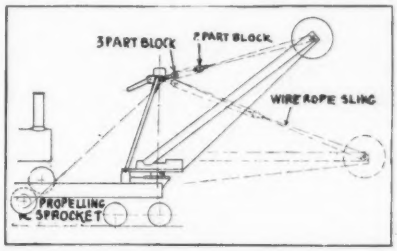
Three-rail, two-way incline from the quarry down to the lime plant

sling about 20 ft. long which has a shackle on each end. The boom is usually loaded on a gondola or flat car.

The boom on an Atlantic-type shovel is so placed on the flat car that the heel of the boom is generally from 6 to 8 ft. from the end of the car. The first move, therefore, in raising the boom is to pull it back into the box of the base trunnion collar casting. To do this, run a block of wood through the spokes of the hoist drum gears and connect the sheave block mentioned above to a chain in order to pull the boom back into place.

Next hang the three-sheave block in the A-frame head front. Then take the 20-ft. wire rope sling. Pass it around the hub of the big sheave, through the spokes of this sheave, around on the other side of the boom and back, dead-ending both ends to the two-part block. This should be done in such a manner that the lead is off the top of one hub and off the bottom of the other, toward the back end of the shovel. Then connect up the sling as shown in the sketch and connect the two-sheave block to this sling, as is also shown in the sketch, being sure to use the large pin in the sheave frame in this connection. Then reeve the ½-in. cable as follows: Pass over the center sheave of the three-part block which hangs over the A-frame head, over the two-part block which has just been connected to the sling, back over the three-part block, then over the two-part block, over the three-part block again and back to the dead end of the two-part block. The loose end of the boom hoist cable is then led down to one of the two propelling sprockets. Take two turns around this sprocket and fasten the end of the cable to one of spokes of the propelling gear.

This method works out very well, for the reason that it is not necessary to disconnect the swinging cable from the swinging drum, as it is well known that on a reversible swinging engine, a clutch connects this engine either to the swinging drum or the propelling machinery.—From the "Excavating Engineer" for March, 1920.



Raising a boom on an Atlanta type shovel

Shaker Scalping Screen

THE FOSTER & CREIGHTON CO. quarry at Rockwood, Ala., has an unusual feature in the way of a shaker, scalping screen or grizzly. The material is elevated up an incline and is emptied onto a large shaker screen which has 2½-in. circular perforations. All under this size falls directly into a car to be shipped as fluxing stone and the rest of the stone passes on to the crushers. The screen is driven by a rocker arm, an eccentric and shaft just the same as smaller shaker screens are operated.

Such a screen takes up but about 2 ft. of headroom, takes the place of a dumping hopper and tends to equalize the feed to crushers. The stone is emptied upon the head end and slowly works down and drops off of the lower end.

An emergency screening frame is mounted but swung up out of the way. In event that the screen in use breaks or is put out of commission, the other screen could be swung down, a screening cloth put on and operation continued with little delay. Besides being a scalping screen this device also takes the place of a hopper.

Daily Cost Report

THE VALUE of daily cost reports is a matter of much difference of opinion among quarry owners and superintendents. However, various forms used for this purpose are always of interest and the one shown herewith is of unusual interest because of the scheme for dividing the cost of production and its completeness.

This form is the one used by the A. T. Small Quarries Co., Macon, Ga., one of the largest crushed-stone producers of the South. It will be noted that the record is very complete and contains practically all the data in regard to production and shipments required for weekly or monthly summaries.

Each daily report, in the lower right-hand corner, carries a summary of operating statistics to date.

A. T. SMALL QUARRIES COMPANY

DAILY OPERATING REPORT FOR DATE DAY MONTH OF 192

	DRILLING STRIPPING	QUARRY	Machine Shop	MILL	Power House	YARD	RAILROAD	Plant Administration	Real Estate	Blacksmith Shop	Miscellaneous	TOTAL
LABOR												
SUPPLIES												
PARTS												
OILS AND GREASE												
FUEL												
DYNAMITE												
MACHINE WORK												
BLACKSMITH WORK												
MATERIAL												
HOSPITAL												
RENTAL												
TOTAL												

Feet Drilled No. 1
Feet Drilled No. 2
Feet Drilled No. 3
Total
Trains Crushed
Hours Operated
Delays
Mill Quarry R. R.
Cause

REMARKS

General Superintendent

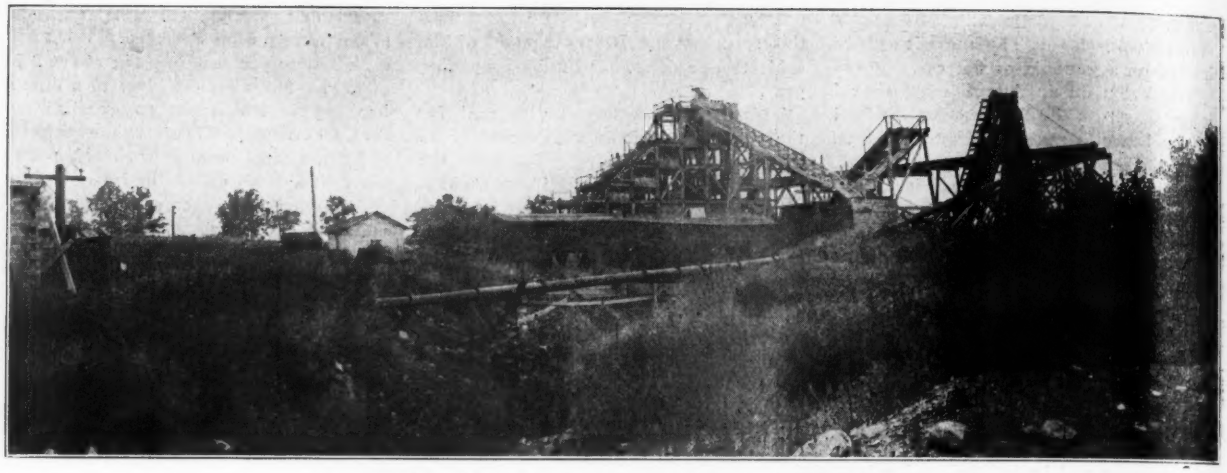
SHIPMENTS

Central Southern To Whom

SUMMARY

Stone Shipped
Ballast Shipped
Total
Cost per ton
Week ending this day
Month ending this day
Average cost to date
Tons Sand Shipped
Total Operating Cost, This Day
Operating Cost Brought Forward
Forward

Form used for a Daily Operating Report at the A. T. Small Quarries Company



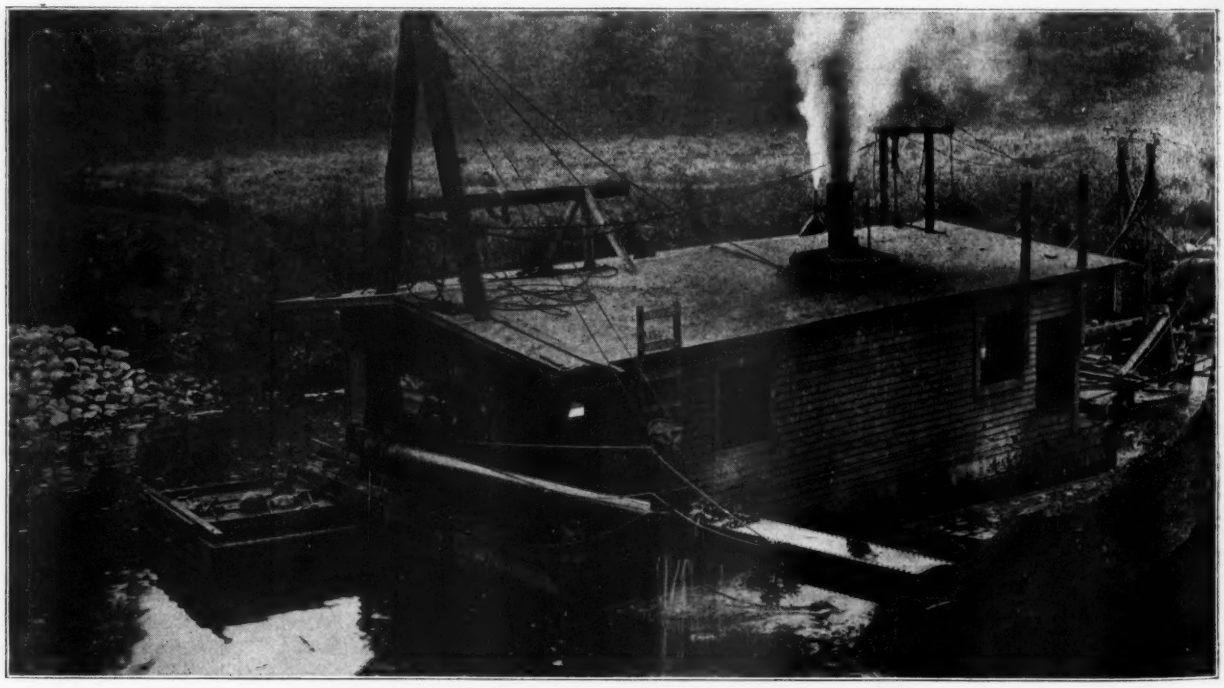
Screening and washing tower and railway car loading bins

Sand and Gravel Pumping Beyond Economical Limit

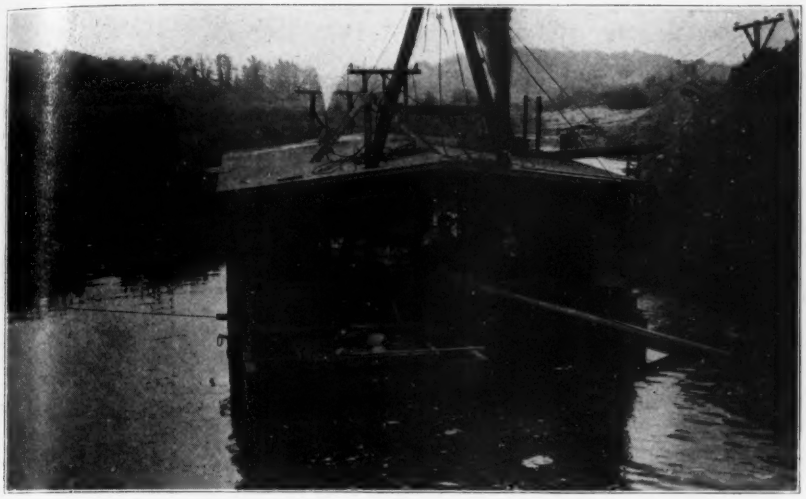
Plant of a Northwestern Producer Which Did Not Prove an Efficient Operation and Has Been Changed to Dry Excavation Methods

WITHIN CERTAIN LIMITS and under proper conditions there is probably no cheaper way of mining and conveying sand and gravel than by hydraulic methods or pumping. The plant described herewith, however, is an example of carrying the method of pumping operation beyond the economical limit. It was tried out for a considerable period and the method of operation herewith described and illustrated has been abandoned since the photographs were taken and a clamshell excavator and narrow gage railway transportation substituted for the pump and pipe lines.

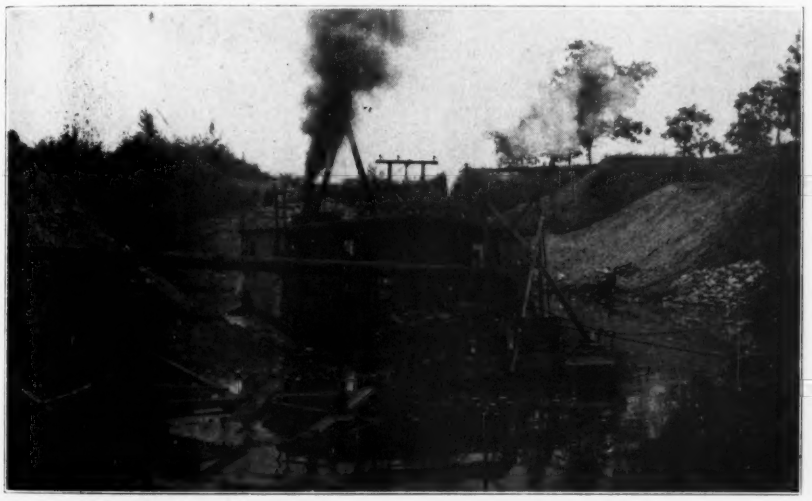
This plant had probably one of the most unusual sand and gravel operations in the country because it combined fea-



Excavating end of the plant, showing high banks of gravel pit



Dredge operating in side of a hill of gravel



Rear of dredge showing delivery pipe to scalping screen

Another view of rear of dredge showing booster pumping station in background

Patented valve for suction intake

tures of both dredging and dry-land plants in one.

The screening plant and bins, in order to be accessible by railway, had necessarily to be placed at a considerable distance from the source of sand and gravel supply—too far for a cable dragline operation. The bins and railway tracks were on high ground, while the sand and gravel deposit is in a low-lying basin, which evidently had been the bed of a stream or lake.

Former Dredging Plant

To begin with, the gravel deposit contained more and larger boulders than are usually met with in a dredging or pumping proposition. The original deposit worked was low-lying and most of the material had to be removed in some manner from under water. But the part of the deposit later worked was a hill rising 30 or 40 ft. above water level. The material in places was quite compact and was loosened and shaken down into the dredged pool by charges or blasts of dynamite.

The original excavating plant consisted of a steam-operated dredge using a 12-in. centrifugal pump designed by a man who has had many years' experience in dredging operations. He was the contractor who dredged out the basins to form lakes which are now one of the most attractive features of Minneapolis' famous park system. This pump had a specially designed runner which makes it entirely feasible to pump boulders up to 8 in. in diameter.

Special Features of Suction Intake

The 12-in. suction main was protected by a steel box as shown in the illustration of the dredge. This kept the suction free and prevented its being buried by slides of the banks. A special feature of the suction line was a trap valve, shown in one of the accompanying views, which was an invention of the designer and has been patented by him.

This valve is a special section of the

Suction end of dredge

suction main attached 6 to 8 ft. from the open-end suction. It has two angle bars cast into the interior of the pipe in such a way as to act as a bar screen. Stones larger than it is desired to handle with the pump are stopped by this bar screen and the suction is soon choked by the accumulation of material behind them. Whenever this happens the dredge tenders pull a cord connected with the flap-valve opening in the side of the pipe and water is taken in through this opening, while the boulder and accumulation of sand and gravel in the suction main drop out by gravity. As soon as the pipe is clear the valve will of course close automatically and remain closed on account of the suction. This device makes it possible to free a clogged suction pipe without the least interference with the operation of the pump. The boulders can of course be dropped at some point under water where they are accessible and can be removed to prevent repetition of the trouble.

Scalping Screen and Crusher

From the dredge the material was pumped through a 12-in. main along the bank of the pool to a scalping screen and crusher. The scalping screen removed everything that would not pass a 2-in. round hole. Alongside the screen, where its opening could catch the screen's rejections by means of a chute, was a small jaw crusher, which reduced the boulders to 2-in. material and less.

Undoubtedly this was one of the most unique crusher installations in the sand and gravel industry. The over-size boulders and pebbles were delivered to it with a goodly stream of water, which passed down through the jaws, without at all interfering with the crusher operation and without injury to the crusher or its lubrication, so far as could be judged.

Booster Pump to Plant

Both the material passing the screen and the crushed boulders were discharged into a pool below the screen-crusher

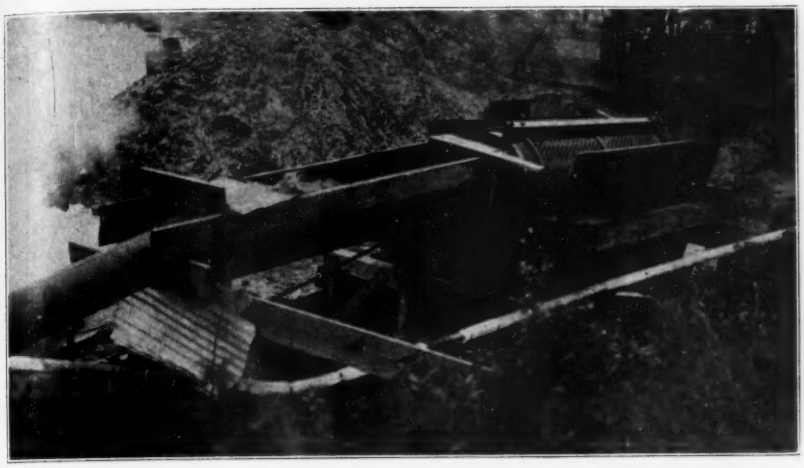
Dredge and bank from scalping screen and crusher

Pipe line from dredge to scalping screen and crusher

Scalping screen and crusher working on pumped material—crusher below at the left of the screen driven by small steam engine

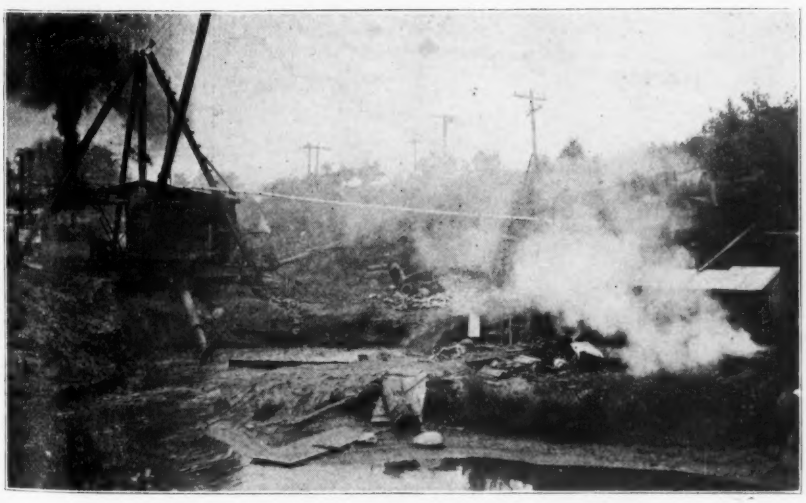
installation. From this pool, or sump, the material was pumped by a 10-in. centrifugal pump mounted in a shed on the bank. The boiler which served the engine driving this pump also served the small steam engine which operated the scalping screen and crusher.

From the 10-in. pump a 10-in. manganese-steel pipe line was carried up the hill to the top of the screening tower,



Delivery end of the scalping screen

Another view of scalping screen and crusher



Second pumping station to relay material to the plant

Showing conditions under which crusher worked, discharge end of scalping screen

a distance of about 1,000 ft. and to an elevation above the pump of nearly 100 ft. Probably this was the limit in both distance and height that any one has attempted to pump sand and gravel.

Screening Plant

The screening tower was originally equipped with rotating cylindrical screens but later the rotating screens were removed and inclined gravity screens, such as are the usual practice at pumping plants in the sand and gravel industry, were substituted.

This is the description of a plant which was given a fair trial and which proved that there is a certain limit beyond which it is not economical to excavate and convey material by the hydraulic method.

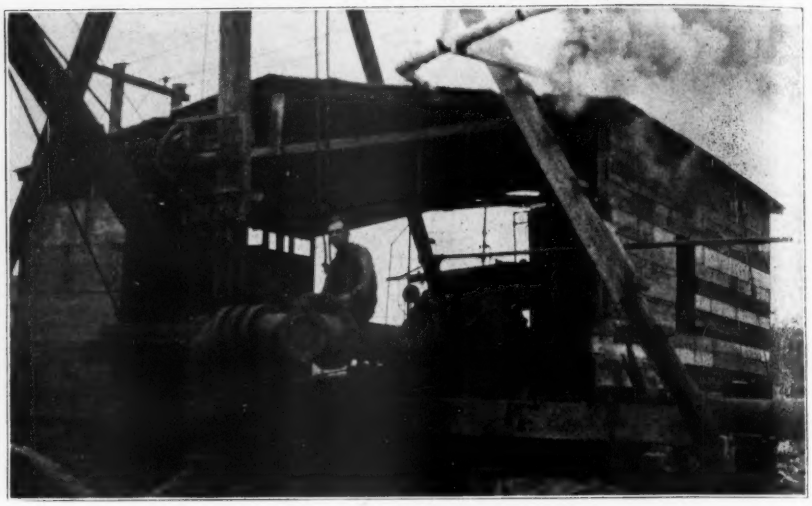
How to Tackle a River Sand and Gravel Pumping Job

"ON THE RIVER PROPOSITIONS we have two kinds of material, one river bed and the other wash-in. The wash-in stuff is easy picking, but the original river bed is usually glued down where you have got to pound it and undermine it to make it cave in.

"If you have got an original river-bed proposition send your nozzle out from your pump so that you can swing backwards into your deposit. Work at the bottom all the time. It takes a little bit more power to handle the stuff from 40 ft. below water than it would only 20 ft. below water, but it is not enough to counteract the advantage of working at the bottom of your deposit, because with just a small amount of excavating underneath your pile of material it will cave. Then you have a pile of soft, loose material from which to pump.

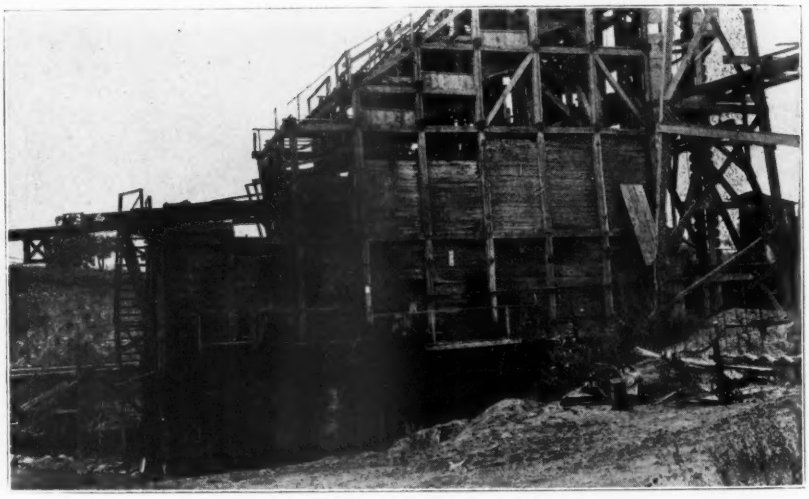
"When you press your nozzle up against your bank, again you undermine it, and so on; but after you have cleaned out your deposit in a river bed and the water goes up and the ice stirs up the bars ahead of you and fills your hole up

Pump and suction of second pumping plant



Booster pump for sending material to the plant

Power plant for crusher, scalping screen and second pump



Screening and sizing plant with car loading bins

again, you have got to turn that system around and go the other way.

"You can't work from the bottom of it because it won't stand up enough to give you any face to work in. It will erode so that under water it won't stand more than about 35 degrees from the horizontal.

"After the stuff has washed in off of your bars about two or three years, it will quit coming because the larger boulders and larger gravel do not wash. Nothing but the smaller stuff washes, and after the smaller stuff is cleaned away you have the bottom of your river paved with boulders—nothing else to come to you. Then you are up against a move.

"We have found that the average is about 4 years in one location for a plant that runs about 15 cars a day. The more cars per day you run the shorter time you can stay in one place. That is the reason we feel we are entitled to claim quite a lot of depreciation on our plants." —R. SNODDY, Manager, Coon River Sand Co., Des Moines, Ia., at the annual convention of the National Association of Sand and Gravel Producers.

Waste water flume from plant to low land

Railroads Ask Thirty Per Cent Freight Rate Increase

Railroads Report to Interstate Commerce Commission the Need of $1,017,000,000 Increased Revenue for 1920 Operating Expenses

WASHINGTON, D. C.—The nation's railroads submitted to the interstate commerce commission statements showing the amount of additional revenues needed to meet increased operating costs and to adjust their income to the 6 per cent income basis provided in the new transportation act. The requirements, they estimate, will mean a 28 per cent increase in freight rates, yielding $1,017,000,000 a year, according to the Chicago Tribune.

The carriers show that while the basis of operating expenses due to higher wages and increased prices of materials and fuel has advanced about 100 per cent, their revenue basis has increased less than 40 per cent, and that it will now require an increase of 20 per cent to restore the relation between revenues and expenses.

Freight to Carry the Entire Burden

The roads suggest to the commission that the additional revenue be gained from freight traffic, leaving passenger rates at the present level. To provide these increases to total revenues without disturbing passenger rates the carriers estimate they will require an average increase in freight rates of about 28 per cent.

Railroads in eastern territory estimate the need of an increase in all revenues of 21.1 per cent, or 30.4 per cent in freight rates.

Southern railroads propose to advance freight rates by 30.9 per cent to provide 20.7 per cent larger revenues.

The needed freight advance in the west is put at 23.9 per cent, to increase all revenue by 17 per cent.

The carriers show that their net income in 1916 was $1,056,000,000, and that in 1919 it fell to $510,000,000, notwithstanding an increased investment in these three years of more than $2,000,000,000. But, the carriers point out if the present level of costs has been in operation throughout 1919, the year's net would have been only $220,000,000, or a little more than 1 per cent on their property investment of $20,616,000,000.

Daniel Willard, president of the Baltimore and Ohio, chairman of the railroad executives' rate committee for the eastern territory, presented to the commission a statement of the situation of the eastern roads, in which he estimated they need $544,000,000 additional revenues to restore the relation of revenues to expenses, and adjust income to 6 per cent.

The net income of the eastern roads, Mr. Willard shows, has shrunk 90 per cent since 1916. Their earnings for the past four years, with 1919, readjusted to the present level of operating costs, have been as follows:

	Net revenues	Operating ratio	Net Ry. Op. income	Decrease compared with 1916
1916	$570,377,155	67.41	$464,434,104	.....
1917	497,477,306	74.21	368,231,549	20.71%
1918	365,341,843	84.71	251,215,146	45.91%
1919	297,706,179	87.87	182,238,706	60.76%
(As adjusted)—				
1919	207,518,156	91.58	42,409,693	90.87%

Mr. Willard also submitted to the commission a summary of the increases in revenues and expenses since 1916, showing the effect of increased rates and increased basis of expenses as of March, 1920, applied to the total business of the thirty-eight eastern systems during the year of 1916, as follows:

Increase in revenues derived from:	
I. C. C. authority 15% case, etc.	$158,462,984
U. S. railroad administration freight increase 25%	337,007,051
U. S. railroad administration, pass. increase 26.98%	86,803,036
I. C. C. authority mail increase 55%	12,554,149
I. C. C. authority express increase 10%	4,311,649
Miscellaneous increase estimated	9,648,011
Total increased revenue, as above. Or 36.37 per cent.	$608,786,880
Increase in expenses, taxes and rents:	
Rates of pay, per hour, 10.33%	$692,786,352
Fuel 154.78%	175,121,726
Materials 74%	156,103,050
Miscellaneous, claims, freight car repairs, and joint facilities, operations, etc.	125,576,367
Taxes	49,318,862
Hire of equipment and joint facility rents	16,282,389
Total increase in basis of expenses. Or 99.10 per cent.	$1,215,188,746
Net increases of cost over increase of revenues	$606,401,866

Misrouting of Lime

IT IS MISROUTING for a carrier to send traffic over an interstate route at a higher rate, if there is a reasonable intrastate route at a lower rate, and the Commission has authority to order reparation for the damage suffered by the shipper of an unrouted shipment. The reasonableness of the rate over the cheaper route is not in question. That is the decision made by Division 2, composed of Commissioners Clark, Daniels and Woolley in No. 10609, F. R. Woodbury Lumber Co. et. al. vs. Great Northern et al., opinion No. 6142, 57 I. C. C. 324-6.

A carload of lime was shipped from Evans, Wash., to Okanogan, Wash. The Great Northern has two routes between the two points, one wholly within the United States and the other partly in Canada. The route through Canada is 171.5 miles long and the rate 40 cents. The American route is 371.5 miles long and the rate 23 cents, prescribed by the Washington authorities.

Notwithstanding the facts that appeared to favor the Canadian route, the Commission held the American to be a reasonable one and the one that should have been used, although the shipment would have been on the road four days instead of only two, moving as it did, over the Canadian route. The Great Northern testified that it was its custom to forward unrouted freight over the Canadian route because it is much shorter, there are fewer terminals and there is no congestion. But the same witness testified that the cost of operation on it was probably three times as great, mile for mile, as on the American route, because of the light traffic, light rail, fear of the bridges and the light power that had to be used. He added that probably nowhere in Washington were rates as high as on that route, a small part of which lies in Canada.

In view of all the facts the second division came to the conclusion that the American route was not unreasonable for the Great Northern to have used for the movement of that one car of lime. Following the Supreme Court in Northern Pacific vs. Solum, 247 U. S. 477, the division said that the reasonableness of a particular routing of traffic as between two routes, one an interstate and another an intrastate route, was an administrative question, within its competency. In that case the Supreme Court said:

> In the absence of shipping instructions it is ordinarily the duty of the carrier to ship by the cheaper route. But the duty is not an absolute one. The obligation of the carrier is to deal justly with the shipper, not to consider only his interests and to disregard wholly its own and those of the general public. If, all things considered, it would be unreasonable to ship by the cheaper route, the carrier is not compelled to do so. The duty is upon the carrier to select the cheaper route only "if other conditions are reasonably equal." Resort to the more expensive route may be justified. And the justification may rest either upon the peculiar circumstances of a particular case or upon a general practice.

The Great Northern did not question the jurisdiction of the Commission to determine the fact of misrouting, but it insisted that it did not have power to award reparation should the Commission hold there had been misrouting, because the lower rate was an intrastate rate over the question of the reasonableness of which the Commission had no control. With that view the Commission disagreed. It said that sending the unrouted shipment over the more costly route was a violation of the first section of the interstate commerce law, in that it was an unreasonable practice. For violation of that part of the law, forbidding unreasonable practices, the decision said, the carrier was liable under Section 8 for the full amount of the damages sustained in consequence of the practice.—Traffic World.

France Slag Co.'s Plant at Toledo

Methods of Pouring Slag, Removing Iron, Crushing and Storing Material

THE FRANCE SLAG CO., Toledo, Ohio, has a practically inexhaustible supply of material for various types of macadam road construction, roofing material, concrete aggregate and railroad ballast from its slag plant in East Toledo, on the grounds of the Toledo Furnace Co. As long as blast furnaces continue to operate there will be a supply of slag.

The iron ore used by the furnace company comes from the Lake Superior region and the limestone from northern Ohio; which, it is claimed, makes a slag of good quality.

How Slag Is Poured

The hot slag is poured so that the quarrying may be done by long, straight cuts. A bank or retainer wall of slag is built up along the edge of the portion to be poured and then the fill is made 30 ft. high. Sixteen-ton ladles are used to haul the hot molten slag from the furnace to the long pits, where it is thoroughly air-cooled and toughened before it is taken to the crusher for sizing.

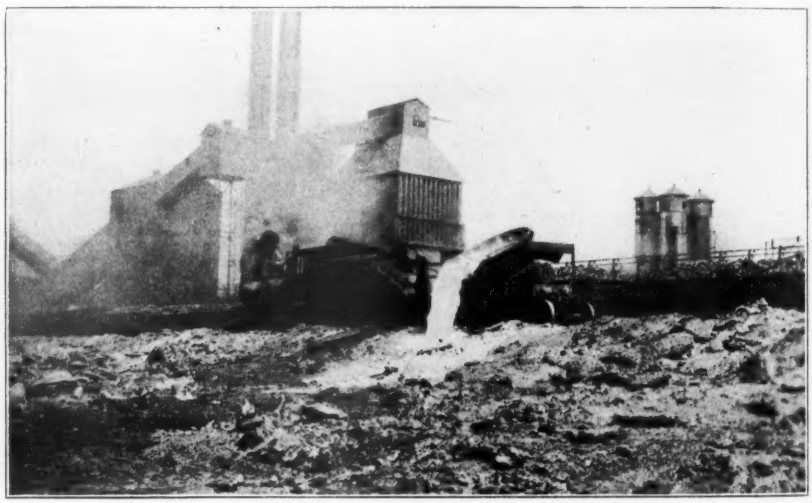
Particles of iron are found in the slag, the larger of which are removed in the pits and the smaller pieces removed by a method later described.

Quarrying Operation

A 95-ton locomotive steam shovel is used to cut the slag from the bank. A view of the bank will give an idea of the tough digging that the big shovel at times comes up against. Often the rear end of the locomotive is lifted slightly off of the track and not infrequently a 1½-in. hoist chain is broken.

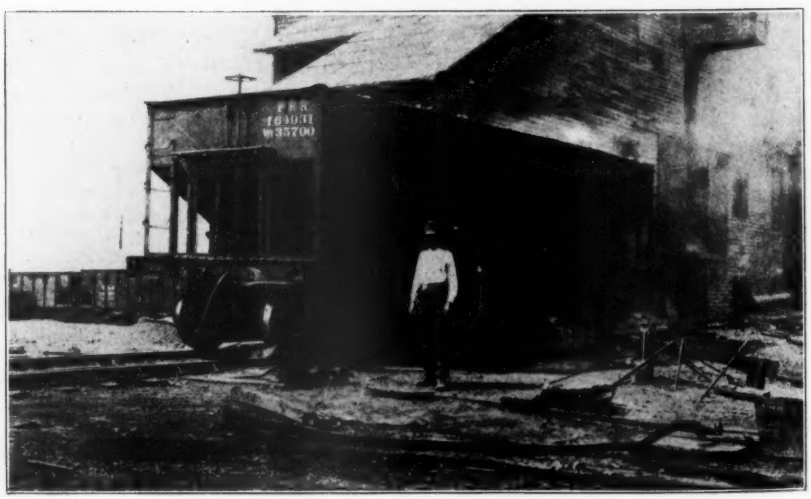
Small-sized standard gauge bottom-dump railroad cars are used to haul the slag to the screening tower. Here they are emptied into a hopper and elevated to the No. 8 gyratory crusher.

The France Slag Co. plant



Depositing slag

Loads of slag ready for shipment



Standard dump car at unloading hopper

Removing Iron

A man is stationed upon a platform part way up the elevator whose duty it is to look for and remove the small pieces of iron still remaining in the slag and not found in the pits. Accompanying view shows the accumulation of iron for a whole season.

A type of elevator designed and built by the superintendent of the plant, and described in another issue of Rock Products elevates the material to a large cylindrical screen. Material over 4½ in. is rechuted to the No. 8 crusher and commercial sizes less than this are sent to storage bins. Two shaker screens separate material less than ⅜ in. into roofing material and a fine binder used on macadam roads. Such an arrangement enables all crushing to be done by one crusher.

Quarry face which steam shovel must excavate

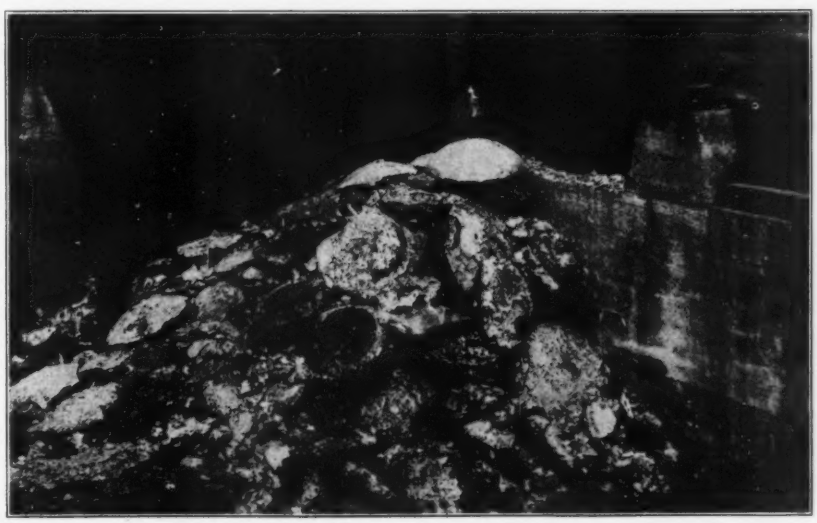
Fine particles of iron not removed from the conveyor are removed before material gets into the screen by a magnet. The elevator empties its material on a short belt conveyor. An electric current is connected to the end driving drum and as the iron passes over this it is attracted to the drum. The slag falls on off of the end but the iron clings and is carried on underneath. As soon as the belt passes under the drum it pulls the iron along and it is dropped on a chute and rejected to a scrap pile.

Operating and Storage Facilities

Material from the loading bins is loaded into railroad cars upon two main tracks. Being located directly on the Toledo Terminal Railway places the plant in direct connection with all of the 22 railroads radiating from Toledo, which offers a wide range of territory for

Storage facilities for rush season

Molten slag just after being poured



Iron pots in slag removed before reaching crusher

sales. Ample storage is provided for to take care of contractors' requirements in early spring or late fall. One hundred and fifty to one hundred and seventy-five thousand tons of material is usually produced annually.

The operation of a slag plant differs from a stone quarry in that slag does not require blasting; that the quarry or pits are not so deep and that the annual capacity of a plant is limited by the delivery of slag from the blast furnaces.

Slag Arguments

It is presented by the France Slag Co., that advantages in the use of slag for railroad ballast, macadam road construction, fireproofing, and roofing purposes, are the facts that slag is about 500 pounds lighter per cubic yard and just as hard and tough as other materials used for the same purposes; it is sharp and angular in shape, with abrupt shoulders and surfaces, giving better "grip" to the railroad ties; it gives a better physical bond in macadam construction; it is high in cementing value; it is lighter than any other aggregate for roofing purposes and absolutely fireproof as an aggregate, having been produced by fire.

The France Slag Co. is a subsidiary of the France Stone Co., and has the same officers, operating and office forces.

Investigations of Crushed Slag and Cement by Bureau of Standards

WASHINGTON.—During the month of December, according to the report of the Director of the Bureau of Standards, investigations were made concerning the effect of Cal, in combination with materials containing amorphous silica, on portland cement mortars. No benefit appeared to be derived from the use of such mixtures over that obtained by the use of Cal alone. Mortars made from various natural cements were treated with Cal. The results varied considerably among the several brands, and, therefore, no general statement can be made as to the probable effect of Cal on this class of cement. The laboratory work in connection with this subject is practically completed and the results are being compiled for publication.

A series of tests was made to compare a new method of making consistency and time of set determinations of neat cement with the methods now used in government specifications for portland cement, as given in Bureau of Standards Circular No. 33. Both new methods involve the use of the flow table devised at the Bureau.

The flow table test for consistency is based on the determination of the increase in diameter of a disk of neat cement, after it has been jolted a given number of times by a table arranged to be lifted and dropped through a definite height by means of a cam mounted on a suitable shaft.

The new method for the time of set determination consists of making the test on disks of cement which have been made up for a given period of time. When the cement will no longer flow outward under the jolting action, it has reached its practical set. The tests made on several different consistencies of standard portland cement, while limited, show that a cement of normal consistency by the Vicat needle (10 mm penetration) has a flow of 145 per cent when two minutes old, and when jolted 25 times through a drop of 1 cm on the flow table. The flow table test for consistency seems to be a more accurate determination than can be obtained by the Vicat needle method. Likewise, the results of the time of set tests by the flow table appear to indicate more nearly that point in the setting of the cement, beyond which it is no longer workable, than results obtained by other methods.

Crushed Slag Investigation

Results of investigation made during the past two years have been summarized in a report called "Crushed Slag as Aggregate in Concrete." The products of three companies, the National Slag Co., the Birmingham Slag Co., and the New England Slag Co. were used in the investigation.

The conclusions of the report are as follows: According to the tests reported, crushed slag as a coarse aggregate produced concrete of as high or higher strength than gravel. The tests have not been extensive enough to determine the durability of slag, but so far as they have gone, no signs of disintegration have been observed, due to sulphides. Slag sand, because of its lack of fine material, does not produce easily workable concrete when used as fine aggregate. If it must be used, its working qualities can probably be improved by the addition of small amounts of fine sea sand, hydrated lime, or other similar material.

In all probability, a larger amount of fine aggregate to replace some of the coarse aggregate would aid workability. Provisions in specifications for slag aggregates calling for a maximum sulphide sulphur content of 1½ per cent and a minimum weight per cu. ft. of 70 pounds have been tentatively recommended.

Silica (Quartz) Industry Growing

SILICA (SiO_2), which is commonly known as quarts or flint, occurs abundantly throughout the United States in deposits of commercial importance in many different forms—as vein quartz, as a constituent of pegmatites, as sand, sandstone, quartzite, novaculite, flint, or chert, and as tripoli and diatomaceous (infusorial) earth. In some of its natural forms, such as rose, smoky, and amethystine quartz, it has value as gem material.

Uses

Silica (quartz) is used for many purposes, principally in the manufacture of pottery, paints, and scouring soaps, as a wood filler, as a polisher, as foundry mold wash in metallurgical and chemical processes, and in small quantities for cosmetics, dentifrices, and numerous other minor uses. In the pottery industry, where it is generally called flint, silica is used in the body of the ware to diminish shrinkage, and is also used in glazes. Silica for use in pottery should contain less than 0.5 per cent of iron-bearing minerals. Manufacturers of paint use considerable quantities of very finely ground silica, which forms as much as one-third of the total pigment in some paints.

For certain purposes finely ground crystalline material is superior in paints to other materials because of the angularity of the grains, which makes them adhere more firmly to the article painted and after wear affords a good surface for repainting. The same angularity makes artificially comminuted crystalline quartz superior to natural sand for use in wood fillers. For soaps and polishing powders ground material is preferred to natural sand on account of its whiteness and angularity. For all these purposes large quantities of pure quartz sand and sandstone are finely ground and yield a product fully equal to that obtained by grinding massive crystalline quartz.

Quartz crushed and graded to various sizes is used in making sandpaper and sand belts, as a scouring agent, for "frosting" glass with sand-blast apparatus, and for other purposes. Blocks of massive quartz and quartzite are used in the chemical industry as a filler for acid towers and as a flux in copper smelting. Ground quartz is also used in filters and in tooth powders and by dentists as a detergent.

Sand and crystalline quartz have been used in making silicon and alloys of silicon with iron, copper, and other metals in the electric furnace. Quartz may be fused in the electric furnace to make chemical apparatus, such as tubes, crucibles, and dishes.

The material known commercially in the United States as tripoli, which is the siliceous residue of decomposed limestones, also yields an excellent grade of pulverized silica, which is used for the same purpose as silica powder obtained from massive crystalline quartz and from sands and sandstones.

Labor-Aiding, Not Labor-Saving Devices in England

By Captain Henry Pooley
B.Sc., Assoc. M. Inst., C.E., London, England

INDUSTRY IN GREAT BRITAIN today is handicapped by the aversion shown by labor to the introduction of what are generally termed labor-saving appliances. Labor objects to this introduction on the grounds that a machine of this type dispenses with labor in the factory where it is introduced. Whether purposely to handicap industry or not, it entirely ignores the fact that with the increased production obtained by the machine many more are indirectly given employment. And within economic limits, the more of such machines that can be installed in all branches of industry the better for the producer, who can produce larger quantities at a cheaper rate; for the consumer, who finds prices reasonably low in spite of the high cost of labor, and for labor itself, which finds more and better employment.

Lack of Personal Management

This is one small factor with which we must contend in our efforts to bring about an industrial settlement today. The whole labor question is bristling with difficulties and it behooves people in this country to seek and apply a solution. Many of our troubles date from the introduction here of the Limited Liabilities Companies Acts, when the master ceased to be a father to his workers and ceased to take a personal interest in their circumstances. In his place came the board of directors, whose chief object was to obtain dividends for the shareholders. In other words, from a throbbing industry with red blood in its veins, when the personal touch was much in evidence, there evolved the colossal machine where men are treated as mechanisms and the human element, so much needed for general happiness, has quite disappeared. Unfortunately once having introduced this state of affairs we cannot return to the old conditions. We have a new set of facts which must be met in a proper way, and the sooner we meet them the sooner we shall arrive at a settlement.

The term labor-saving appliances has crept into our language and it is most unfortunate. Its very meaning is a warning to labor to beware of any such appliance. And we cannot blame the worker who objects to the introduction of anything whose object is to save or do away with his labor. But, as already pointed out, the introduction of such an appliance does not save labor. It actually increases employment and aims at a greater individual output. Surely a better word could have been discovered—one which would not be such a contradiction in terms and would not mean just the opposite to that which is intended. Why not have classed such machinery as, say, labor-aiding appliances? It is not improbable that had such a term been employed from the start more than half the objections raised by labor would never have been born, and a further quarter would have died at birth. It should be the object of every one interested in the settlement of industry to wipe the old and wrong name right out of their vocabulary and introduce a term which more nearly represents the true meaning, and no better term occurs to the writer than that of labor-aiding appliances.

Sir John P. Griffith, president of the British Institution of Civil Engineers, has already emphasized this point and recommended the change in this country on more than one occasion, but his lead does not appear to have been followed and every one still talks of labor-saving appliances when they mean just the reverse.

As far as the writer is aware, in the United States the same state of things is apparent. It may be that there is not the same urgent need as in this country to correct the erroneous impression produced upon labor, but at the same time it would be just as well to call an appliance by a name which indicates what it is and which does not convey a diametrically opposite impression.

The writer had the pleasure of seeing an article by him on the subject of the urgent need for labor-saving appliances in Great Britain published on September 13th last in Rock Products. At that time as indeed at the present also, never was the need for the introduction in this country of labor-aiding appliances more apparent. Since that article was written the labor position has certainly not improved and has caused quite a considerable amount of thought and discussion in all quarters, and the truth of what is emphasized has become more and more evident. At the same time it has since been forcibly brought home to the writer that the discussion should have spoken of aiding labor and not of saving labor, and then perhaps helped a little toward the object of the present article. We must cease from a practice which only irritates the mind of the worker and arouses his suspicion, and we must endeavor to call a spade a spade, and a machine for increasing individual output a labor-aiding device.

[In this country (United States) the same difficulty does not apparently exist at the present time. The ambition of every laboring man seems to be to get someone else or a machine to do the laboring for him, while he is perfectly content to boss the job.—Editor.]

From Far-Off Australia; Labor Troubles Too

"GENERALLY THE BUILDING trade is booming," writes a friend and subscriber of Rock Products at Mt. Nassau, Granton, Tasmania, Australia. "My remarks apply to the whole of Australia and not only this particular state. My particular business is lime burning, both for building and agricultural use. The education of the farmers in the use of lime is very backward and they need a lot of convincing as to its value.

"We are much hampered with short supplies of cement, bricks, lumber and in fact all building requisites. There is a great scarcity of labor and the trade unions are so jealous that it is hard to see how this difficulty is to be overcome—just one instance: We have vocational training for returned soldiers, but after a man has learned the technical part of a trade he is debarred from the practice of it, for he is regarded as an apprentice, and only a limited number of apprentices are allowed by the unions to a fixed proportion of tradesmen.

"Reverting to general trade conditions our high tariff, heavy freight charges and above all, the exhorbitant exchange, are killing trade between Australia and the United States. I sent for a lime soil tester mentioned in Rock Products. The price of the article was $9.50 and I had to pay $2.16 for the draft. I wrote some of your advertisers in regard to some machinery I could use, but the above exchange rate puts the possibilities of business out of court.

"Everything over here is on the upgrade, but the scarcity of labor is the greatest bar to fully developing our resources."

Rock Products now circulates in practically every quarter of the globe where the English language is read. Letters from our foreign readers are welcome at any time.—Editor.

Cement Manufacturer Adds Side Line of Crushed Stone

Bonner Portland Cement Company, Kansas City, Co-ordinates Manufacture of Cement and Production of Commercial Stone

BECAUSE OF THE EXTENSIVE BUSINESS and industrial expansion in Kansas City that city and district makes an excellent and ever-increasing market for building material. The Bonner Portland Cement Co., whose main office is at Kansas City, operates a 1,500-bbl. capacity, dry process cement plant at Bonner Springs, Kan. Bonner Springs is located about fifteen miles out of Kansas City on the Kansas City, Kaw Valley and Western Electric Railroad and the Union Pacific and Atchison, Topeka & Santa Fe railways. Because of a growing demand for good coarse aggregate near Kansas City this company has equipped its plant so that it is able to handle a commercial crushed stone business.

Quarry conditions will make it possible for the Bonner Portland Cement Co. to produce a very clean product. The excavation of the rock is a hillside operation; that is, the quarry floor is above the ordinary ground level. One of the accompanying views will give an idea of the face—the first 20 feet is a clay and limestone mixture, then 20 feet of shale and a 40-foot ledge of limestone. The lower ledge of rock is very clean. There is an additional 27 feet of rock below the face now being worked which will be opened with a second bench and worked for the commercial crushed stone product.

Crushed Stone Production

It is intended that the cement and stone business shall be co-ordinated. First of all it is intended to supply stone to cement users; that is, where cement customers want stone they will be considered first. The same initial crusher is to be used for all material for both commercial and cement manufacturing purposes. This is a 36 by 60-inch roll crusher.

The other crushers for the cement rock will be a No. 7½ gyratory and for the commercial product two No. 6's and one No. 4 crushers will be used. Also it will be possible to dispose of screenings from the commercial stone as fine aggregate material. In event that the cement plant requires stone faster than the crushers can supply this can be furnished by the commercial plant, or if the production of cement is below normal and the demand for stone is above, the arrangements will allow the No. 7½ crusher to be used for commercial stone production.

Quarry Operation

An ideal hillside location was selected for the new crushing plant and quarry cars are able to dump into the initial breaker from the quarry floor level. A large storage bin of 1,500 tons capacity has been built to retain a supply of cement rock and shale while the plant is working on the crushed stone business.

An 85-ton locomotive shovel and a 45-ton traction shovel are used in the quarry. The drilling is done with steam-driven well drills and compressed air tripod drills.

The tracks from the crusher to the cement mill are upon a slight grade so that the cars run down the grade by gravity and a cable arrangement permits the loaded car to pull the unloaded car back up to its position at the crushing plant.

After the No. 7½ crusher the stone is fed to a coal-burning drier. The coal for firing is contained in large metal bins above the firing end and the stone is fed from another hopper. The shale is reduced in a Sturtevant mill and goes to a separate drier. The plant has storage for 350 tons of dried rock and 50 tons of dried shale.

Proportioning Mix

The mix is proportioned by weight. A small car runs along under the rock and shale bins and a weighed amount of each is put into the car.

The initial stage of the pulverizing is done by a large Sturtevant mill and the second stage by seven Griffin mills. The pulverizing machinery is arranged in a battery just at the side of the kiln room and the material is delivered to feed bins above the kilns.

Clinker Burning

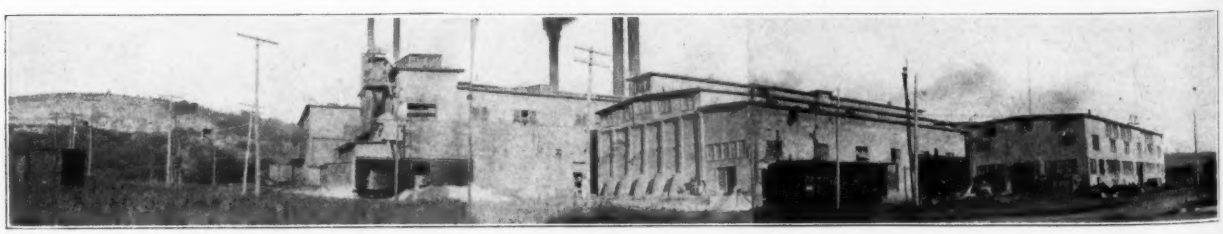
The kilns are 8 by 110 feet and the material is fed into them by gravity. Coal is supplied to kilns similarly to the method used for the driers. A method has been devised of utilizing part of the heat of the clinker as it falls from the kilns; this process has been described in a previous issue of ROCK PRODUCTS in the "Hints and Helps for the Plant Superintendent" department.

A steel-pan elevator delivers the clinker to a sprinkler cooler, where it is cooled by water. A small Moser crusher reduces large sizes to pebble size. Clinker is either immediately sent to the finishing mills or put into an 80,000-bbl. storage by a pan conveyor. To remove clinker from storage a scraper and an electrically driven hoist is used. Finishing is done by a battery of twelve Griffin mills. The finished product is delivered to the packing house, where it is bagged by an automatic bag-packing machine.

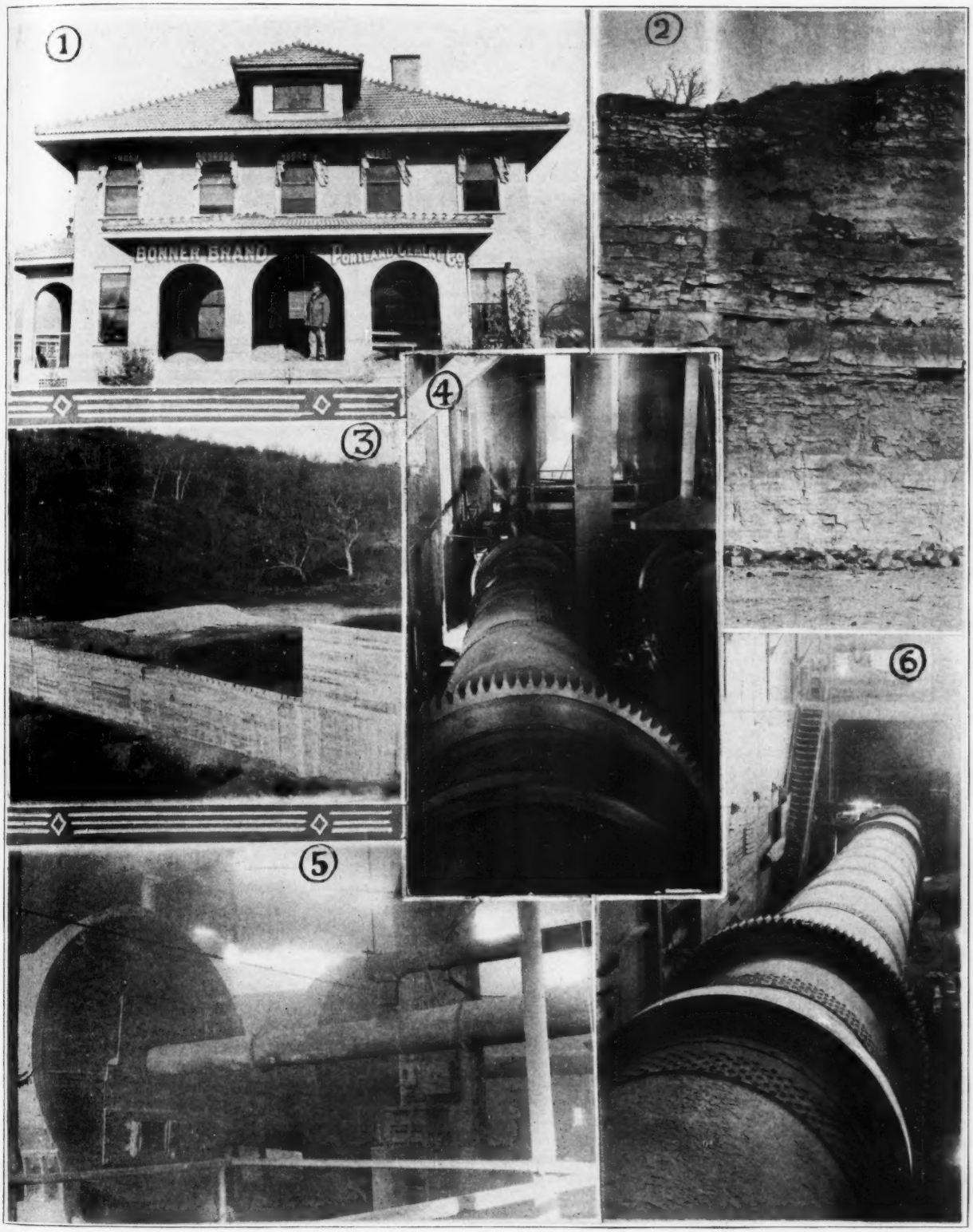
Machine Shop and Power House

Some of the interesting auxiliary departments are a machine shop, a water storage basin and a power plant. The machine shop is fitted out to do all overhauling of machinery and to make emergency repairs. A hydraulic press, three lathes, a grinder, a planer and shaper and a drill press are among the machines installed.

At present this company is manufacturing its own power by the use of coal-



Quarry (to left) and plant of the Bonner Portland Cement Co.



(1.) Office and chemistry laboratory of the Bonner Portland Cement Co. (2.) View of the quarry face showing the stratification of the stone. (3) Construction view of the reinforced concrete dam which will reserve a large water supply. (4.) View of the driers showing the steel coal chutes suspended above driers. (5.) Firing end of kiln showing hood and method of firing. (6.) One of the kilns

burning boilers. In the near future the power plant will be converted so that electric power will either be bought or the waste heat from the kilns will be used. The latter project has been under consideration for some time but no definite action has been taken.

The power plant has a horse power of 1,400 and this is used to run an alternating current dynamo and an air compressor. Current is supplied to all the departments where the machines are driven by separate motors. Three Fuller mills are used to pulverize coal for the driers and kilns. The coal for the boilers is delivered directly to the boiler room or to a ground storage.

An inexhaustible supply of water is being insured by the erection of a concrete dam in between two hills. This will retain the water from running springs and the spring rains and will hold sufficient to operate the plant the year around. The addition of this water storage will save pumping water from the river, which is considerable distance from the plant.

The officers of the company are Henry McGrew, president; Philip Graff, vice-president and treasurer; Harold Steeper, secretary; J. T. McGrew, sales manager; U. S. Hannum, superintendent; Chris Goll, chemist, and E. S. Cable, purchasing agent.

Talc and Soapstone Production and Uses

The United States Produces and Consumes More Than One-Half of World's Talc

By J. S. Diller, U. S. Geological Survey

THE TOTAL SALES of domestic talc in 1918 amounted to 191,477 short tons, valued at $2,089,960; those of 1917 amounted to 198,613 short tons, valued at $1,889,672. Therefore 7,136 short tons, or nearly 4 per cent, less domestic talc was sold in 1918 than in 1917, but because of the advance in price the value was $200,288, or about 11 per cent, greater.

Thirty-one producers of talc reported to the United States Geological Survey in 1918, of whom there were 8 in California, 6 in Vermont, 6 in North Carolina, 3 in New York, 2 each in Georgia, Maryland, and Pennsylvania, and 1 each in Massachusetts and New Jersey.

Vermont ranked first in production, with a decreased output, the total sales being 90,537 short tons, valued at $775,012. New York, with a decreased output, ranked second in quantity and first in value, the total sales being 71,167 tons, valued at $902,100. California ranked third, with a total production of talc and soapstone of 11,864 tons in 1918. This was more than 2½ times the quantity of talc produced by California in 1917, besides a considerable quantity of soapstone. This decided advance in the production and utilization of talc, notwithstanding a slightly local decline in the average price on the Pacific coast, is one of the most important and significant features of the year in the development of the domestic talc industry.

Occurrence and Distribution

Talc occurs in highly crystalline rocks, schists and gneisses; and generally results from the alteration of other magnesian minerals, such as pyroxene and hornblende. Its occurrence in commercial quantities is limited to ancient crystalline terranes. The finer qualities of talc are commonly associated with limestone and have been derived, as in New York and western North Carolina, from the alteration of tremolite schist in the limestone. The lenses of talc or tremolite schist usually stand on edge in the limestone and have to be mined by underground methods.

In North Carolina and Georgia the talc is associated with limestone, but in Hartford County, Md., where the largest producing mine of fairly high grade talc is now in operation, the talc or soapstone, as it is often called, is an alteration product apparently of pyroxene in a large dike of basic igneous rock, probably pyroxenite or peridotite. Much of the rock is changed to serpentine and finally to talc.

Of the great bulk of domestic talc marketed in the United States 95 per cent comes from nine States in the mountainous belt near the Atlantic coast, and about 5 per cent comes from California in the mountainous belt near the Pacific coast. In the broad stretch of 2,000 miles across the Mississippi Valley and the Great Basin there are at present no producing talc mines, although talc is known to occur and mines may yet be opened in the Rocky mountains.

Principal Uses

The principal uses of powdered domestic talc are in the manufacture of paper and toilet powder, but the most valuable talc is that which is so uniformly fine grained that it can be readily cut and bored in making gas tips and similar objects. The United States is well supplied with low and middle grades of talc suitable for paper but is deficient in high-grade material for toilet powder, pencils, and gas (lava) tips. Most of the domestic material of high grade comes from North Carolina and Georgia, but recently it has been mined also in California, Vermont, and Maryland.

Imports

About 4,440 tons, or 24 per cent, less talc was imported for consumption in 1918 than in 1917 and prices advanced everywhere. About 10 per cent of the imported talc was crude and the remainder ground. Of the imported talc 96 per cent came from Ontario, Canada. The remainder was chiefly high-grade material from Italy, but a small portion came from France.

Of the total world's production, probably less than one per cent was used in crude form and the remainder was ground. The large output of the United States (58 per cent of the world's production in 1918) is a matter of interest, but when we consider that in addition to its large production the United States imported more than 10 per cent of the total quantity of talc produced by all other countries combined and exported very little, it becomes strikingly evident that the United States is pre-eminently a consumer of talc. Of the world's production in 1918 the United States produced 58 per cent and consumed nearly 63 per cent, leaving approximately 37 per cent for consumption by the rest of the world.

A Granite Veneered Concrete Building Block

EVANSVILLE, IND.—By the use of crushed granite applied as veneer in the face of their regular cast concrete blocks, the John H. Tekoppel Co. of this city, has produced a new granite-faced block, which the company believes surpasses any other concrete block on any other system for durability, beauty, strength or imperviousness to heat, or moisture. The block is absolutely waterproof. Genuine crushed granite brought from Crown Point, N. Y., near the Hudson river is used in making this block. The method used in applying these granite crystals, makes the facing the strongest part of the block. All visible traces of cement are removed from the face of the block. The process has been thoroughly tested out and has proven that it can stand any kind of weather or any kind of strain.

The new blocks are made by the same method as the regular concrete blocks except that the granite facing is added.

Practical Chemistry for Lime and Cement Manufacturers

III—Chemical Equations and Theory of Chemical Combinations, With Special Reference to Rock Products Industries

By Richard K. Meade, M. S.
Consulting Chemical and Industrial Engineer, 11-13 E. Fayette St., Baltimore, Maryland

CHEMISTS HAVE also extended the system so as to show chemical changes that take place when a substance is broken down in various manners. Thus, when lime is heated, a certain change is affected and the change is thus expressed:

$$CaCO_3 = CaO + CO_2$$

This means that when calcium carbonate is heated it decomposes into calcium oxide and carbon dioxide. It furthermore means that when one molecule of calcium carbonate is heated one molecule each of calcium oxide and carbon dioxide are produced, and hence that the proportions of the elements entering into the reaction are 100 of calcium carbonate, 56 of calcium oxide and 44 of carbon dioxide. Or, when 100 pounds of calcium carbonate are heated 56 pounds of lime and 44 pounds of carbon dioxide are produced. This relation is fixed and the amounts are always the same.

Similarly when lime or calcium oxide slakes the following change takes place:

H_2O + CaO = $Ca(OH)_2$
Water + Calcium Oxide = Calcium hydrate.

This implies that 18 pounds of water unite with 56 pounds of calcium oxide to form 74 pounds of calcium hydrate or hydrated lime.

This method of expressing a chemical change is known as a "chemical equation" or "reaction."

We may consider in the light of the above that calcium carbonate is composed of calcium oxide and carbon dioxide and that calcium hydrate is composed of calcium oxide and water and to have the following percentage composition:

Calcium Carbonate

Calcium oxide....	$56 \times 100 \div 100 =$	56%
Carbon dioxide....	$44 \times 100 \div 100 =$	44%
Mol. Wt.....100		100%

Calcium Hydrate

Calcium oxide....	$56 \times 100 \div 74 =$	75.6%
Water	$18 \times 100 \div 74 =$	24.4%
Mol. Wt.... 74		100.0%

This method of expressing the composition of a compound by stating the percentages of important chemical constituents is much more common than that of resolving it into its ultimate elements.

Chemical Affinity

The force which holds two or more atoms together to form a molecule or compound is called *chemical affinity*. It corresponds to the physical force of *cohesion*, which holds molecules together to form a compact mass. When two elements show a strong tendency to unite we speak of them as having an affinity for each other. Affinity may therefore be said to be the mutual attraction which atoms of different elements have for one another, or the tendency of atoms to group themselves together to form molecules.

Hydrogen and oxygen unite to form water, iron and sulphur to form iron sulphide, carbon and oxygen to form carbon dioxide. In each case we speak of the attraction between the atoms as the affinity between them—the affinity of hydrogen and oxygen, of iron and sulphur and of carbon and oxygen. Chemical affinity exists between some elements and not between others. Why certain atoms are attracted to others is not known and there is no law by which chemical affinity can be predicted. In all cases our knowledge of chemical affinities is the result of experiment and observation. There is not always an affinity between elements, thus the gases fluorine and argon do not appear to have an affinity for oxygen. Affinity may be considered as an attribute of the individual atom and exists in different degrees between different elements.

The metals have a strong affinity for oxygen. When we say this we mean that the attraction which these have for each other is sufficient to make them unite whenever possible. We all know how easily iron rusts and other metals tarnish, for example. Iron rust is simply the oxide of iron or the combination of iron and oxygen and most tarnish is the oxide of the metal tarnished, or a combination of oxygen and the metal. The atoms of these elements are first drawn together and then held in a close bond by the chemical affinity which exists between them. Oxygen being present in the air is of course always in contact with the metal and gradually unites with it.

Where the affinity of two elements is stronger for a third element than for each other, the three will rearrange themselves.

Possibly some of my readers may have prepared "soldering fluid," which is made by dissolving zinc in muriatic acid (hydrochloric acid). Zinc is an element and hydrochloric acid is a compound of two elements—hydrogen and chlorine. Chlorine has a stronger affinity for the zinc than it has for the hydrogen. Consequently when we act on the zinc with the acid, the zinc takes the chlorine away from the hydrogen. The hydrogen being a gas passes off from the liquid in the form of bubbles.

We might represent the relative affinities between these elements by means of broad and faint lines, the broad lines representing the greater affinity. For example, let us take the change just given and represent the affinities graphically as in Fig. 1.

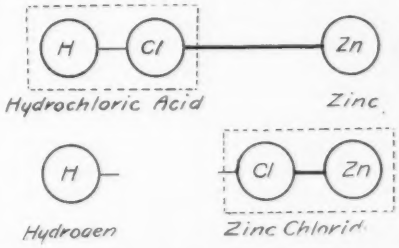


Fig. 1, illustrating chemical affinities

Naturally the weaker affinity gives away to the stronger. Just as if two men were pulling on an object one with a rope and the other with a cord, the cord would naturally break and the object would be drawn to the man with the rope. Do not get the idea, however, that chemical affinity is a bond like a rope or a cord, nor that the atoms actually touch each other.

We, of course, do not know very much about the actual nature of the force which we call chemical affinity. We have examples of similar forces acting between bodies —gravitation, for example. Gravitation, however, depends solely on the mass or weight of the bodies, whereas chemical affinity depends on the individual nature of the atoms. The attraction which two particles charged with electricity of a different sign have for each other is another example and possibly one nearer to chemical affinity.

Heat and electricity are great helps in breaking down the affinity between elements. The use of a third element or compound whose atoms have an affinity for those composing the compound which we desire to decompose is also quite common. Such a compound is called a "reagent."

Often two or more reagents are employed at once, as for example, a reagent with heating, etc.

The affinity between two elements often gets much less and sometimes ceases altogether as the temperature increases. Thus water is decomposed into hydrogen and oxygen when steam is heated to a high enough temperature and the two gases recombine when the mixture is cooled again.

Similarly calcium carbonate or limestone is decomposed by heat into calcium oxide (lime) and carbon dioxide when heated to a temperature of about 900°C. The affinity between the lime and the carbon dioxide being broken down at this temperature.

To return again to the case of iron rust, if we wish to decompose this again to iron it would be necessary to act upon it with some atom which has a stronger affinity for oxygen than has iron. Hydrogen and carbon are both such elements.

Most of us know that iron is made by charging coke, iron ore and limestone into a blast furnace. Iron ore and iron rust are both iron oxide. Coke is largely carbon. The latter element unites with the oxygen of the ore, leaving the iron free. The limestone is used to form a slag with the impurities in the ore.

We know how easily acetylene gas can be set on fire, this is due to the fact that the affinity which exists between the atoms of carbon and hydrogen which form the acetylene is less than the affinity of carbon and oxygen and of hydrogen and oxygen respectively.

In the case of acetylene, the affinity between the carbon and hydrogen is sufficient at ordinary temperatures to hold them together and it is only when the mixture of acetylene and oxygen is heated that the attractions of carbon and oxygen and of hydrogen and oxygen exceeds that of carbon and hydrogen.

In most explosives the atoms are very loosely combined; so much so that when a sudden shock or elevation of temperature occurs the atoms rearrange themselves into new groups in which the attraction or the affinity is greater. Usually these new compounds are gases and consequently occupy a much greater volume than that of the explosives. This volume is also greatly increased due to expansion from the heat formed by the process of the rearrangement of the atoms. The effect of liberating this relatively large volume of gas is to exert a sudden violent pressure and create what we call an explosion.

Nitrogen is an element which has only a very weak affinity for the other elements, consequently its compounds are very easily decomposed. Nitrogen is present in most explosives. Ordinary black powder, smokeless powder, gun-cotton, nitro-glycerine and that powerful new explosive, TNT, or trinitro-toluene, are all nitrogen compounds and are easily decomposed by a very slight elevation of temperature or by a sudden blow or shock. Ordinary black powder is a mixture of nitrate of potash, charcoal and sulphur. Charcoal is a form of carbon. Nitrate of potash has the formula KNO_3 and gives up or lets loose of its oxygen very easily. The function of the charcoal and sulphur is to effect this decomposition and to recombine with the oxygen because of their great affinity for this element. As the new products formed are gases they occupy a considerably greater volume than the original powder. This volume is greatly increased because of the heat which is generated by the literal burning of the carbon and the sulphur.

It is hard to break up the attraction which some elements have for each other and relatively easy to do this in the case of others.

Two solid substances will seldom react upon each other if cold and dry even when they are very finely powdered. In order to make solids react together it is usual to heat them together or to dissolve them in some liquid such as water and then to bring the solutions together. Liquids and solids or gases and liquids react together much more often.

For example, if we mix calcium chloride and sodium carbonate together dry no reaction takes place, but if we dissolve each salt in some water and then pour the liquids together we will have formed two new compounds, calcium carbonate and sodium chloride. As calcium carbonate is insoluble in water, the two solutions when mixed will turn milky—the latter appearance being caused by the calcium carbonate which is formed as a very fine powder suspended in the water. Gradually this powder will settle and the clear liquid above will be found to contain salt (sodium chloride).

(To be continued)

Building Operations in 1919

REPORTS RECEIVED by the United States Geological Survey, Department of the Interior, from the building officials of 114 of the larger cities in the country show that building operations in 1919 greatly exceeded those in 1918, both in number and cost. The number of permits issued or buildings erected in these 114 cities in 1919 was 309,551, as compared with 173,635 in 1918, an increase of 135,916 or 78 per cent.

The cost of the operations in 1919 was $1,130,817,591 as compared with $369,252,315 in 1918, an increase of $761,565,276 or 206 per cent.

If the operations in the remaining cities from which the Geological Survey usually receives statistics of building operations show a proportionate increase the number of permits issued or buildings erected in 1919 was about 377,000, which would cost about $1,300,000,000, so that the record for 1919 was the highest yet reached in the building industries in these cities in both the number and the cost.

The year of the next highest record was 1916, when 347,761 operations were reported, which cost $1,046,276,549. The average cost per operation in the cities which have so far reported for 1919 was $2,127 in 1918 and $3,653 in 1919.

Tests Prove Lime in Mortars Prevents Corrosion

ASSERTION has been made that the presence of lime in mortars and concrete materials reduces or prevents the corrosion of metal that may be enclosed. The chemical laboratory of the National Lime Association has undertaken some preliminary tests along this line. Slabs of various cement and mortar materials used in building construction have been made up without lime and with varying quantities of lime, in which the metal strips are encased. These are cured for different periods at the end of which time the slabs are broken and the metal examined. The amount of lime used has varied from 0 to 100 per cent.

Wherever no lime was included in the gypsum mixture, rusting of the polished metal strips occurred more or less throughout the length of the slab but where as little as 5 per cent of hydrated lime was added there was absolutely no evidence of rusting of the steel. This is suggestive of the advisability of using lime in gypsum mixtures where they are in contact with metal since this avoidance of rusting is likely to improve the durability of the construction.—National Lime Association Press Report.

Lime Association Wants Head for Construction Department

AT THE RECENT meeting of the Board of Directors of the National Lime Association in Philadelphia it was decided to appoint a head for the Construction Department of the association to take the place of N. G. Hough who has resigned, just as soon as a suitable man can be found. A Committee on Organization consisting of Charles Warner, Wilmington, Delaware, B. L. McNulty, Chicago, Illinois, C. I. Starrett, Cleveland, Ohio, was authorized to look up suitable candidates and to make the appointment as soon as possible.

The requirements for this position are rather high. First of all the candidate should be a graduate engineer. In addition he should have had a number of years of practical experience in building construction and preferably also in research work touching the various types of construction material including lime plasters. He should be a man of a research type of mind. In addition it is necessary that he have a breadth of grasp of business problems, openness of mind, and a personality that will enable him to work effectively with a wide range of persons.

State Highway Engineer Helps Fight Railroad Problem

Realizing Effect of Shortage of Material, Wisconsin State Highway Engineer Protests to Railroad Presidents

BECAUSE OF THE acute shortage of cement throughout the state of Wisconsin thus hampering the building of the state highways, A. R. Hirst, Wisconsin state highway engineer, has written a letter to the presidents of all railroads serving the state, explaining the situation and showing the results of such a condition. Extracts of Mr. Hirst's letter follow:

"Wisconsin had financed for this year a very large highway program involving the expenditure of $20,000,000 and the construction, among other types of highway, of 400 miles of concrete road. Due partly to high prices, but more largely to the lack of labor and materials and of facilities for transporting them, the state has voluntarily reduced its highway program to about one-third, believing that this policy was best for the public interest.

"We have, under this policy, let contracts for about 110 miles of concrete road which, with 30 miles carried over as incompleted last year, gives us a building program as limited as is reasonably possible, and which should be carried out for the benefit of all interests in the state.

"The time has arrived when contractors should commence to accumulate materials for this construction and we find that the work is practically hamstrung due, primarily, to the fact that practically no cement is being received in the state. Not only are contractors on our work without facilities for accumulating cement so that a safe start may be made, but we have numerous complaints from dealers all over the state to the effect that their stocks are out, that replenishment seems impossible, and inquiring whether we cannot turn over some of the state cement to them in order that ordinary building construction (what there is of it) may proceed. As a mater of fact, we have no cement, nor unless conditions immediately improve, have we much hope of getting any for weeks.

"This forced almost total suspension of the building industry, with the throwing out of employment of contractors, laborers, skilled craftsmen, as well as of men employed in plants producing sand and gravel, is apt to create a serious condition.

"We thoroughly understand that the railroads are operating under extreme difficulties which have been intensified by the recent strike, but it would appear that with grain and potatoes largely moved it should be possible for the lines operating in Wisconsin to furnish a reasonable number of box cars to the cement companies customarily shipping by rail into Wisconsin.

"We understand that practically all mills are filled to the brim with stored cement and that unless some relief is afforded them, they will be forced to cease manufacturing it at a time when, if Wisconsin is representative, the whole building program in the middle West is paralyzed for lack of this most essential material.

"We believe that the conditions outlined above, which I am sure you can verify by the most cursory inquiries, are sufficient to create an emergency which justifies the attention of the highest officials of the railroads.

"Outside of all other considerations the fact that production of all kinds should be stimulated at this time must be recognized by all thinking men. The moving of 100 or 1,000 box car loads of freight may mean many thousand hours of productive labor in many other industries, but with few exceptions, I can think of no way in which more stored productive energy can be released with an equal amount of transportation capacity than would be the case if this available cement were quickly released for use.

"I beg to point out that the release of a few cars for an occasional highway job would be of small service. We cannot prosecute highway construction at the expense of the other building industries. They must be supplied first. The whole state is practically bare of cement and what is needed is an intelligent, concentrated, worth-while attack on the whole problem of supplying enough cement to Wisconsin to enable it to carry out a very restricted general and highway construction program."—A. R. Hirst, Wisconsin State Highway Engineer.

Exports and Imports of Cement for February

STATISTICS COMPILED by the Bureau of Foreign and Domestic Commerce give the value of imports of cement into the United States during February, 1920, as $713. Figures covering domestic exports of this commodity for the same period show the total quantity to be 336,316 barrels, valued at $1,046,258.

System of Cost Accounting for Lime and Stone Producers

A SET OF FIVE BOOKS, descriptive of the system of cost accounting and giving the outline of the forms used by the National Lime Association in determining the cost of producing lime, were made available to non-member producers of lime and stone by a recent action of the board of directors.

This system of accounting was developed by the National Lime Association for the use of its members at a rather large cost to them. The system is in use by all of the larger lime-producing companies in the association. A few sets of these books are on hand and it seemed to the directors that it would be a good service to other producers of lime and stone to make this system available to them at a very reasonable price. Further information concerning these cost accounting books may be had from the office of the association in Washington.—National Lime Association News Letter.

Investigation of Effect of Pneumatic Tools on Workmen

EFFECTS OF PNEUMATIC tools on the hands of workmen, reported by the Bureau of Mines, have been investigated by Dr. F. M. Barnes of St. Louis, who was retained by the operators to study conditions in the Bedford, Ind., limestone region. The workers are subject to a disorder particularly of the left hand known as "white fingers."

The first effect is described as a feeling of coldness and pricking; the fingers then turn white and become numb. If the hands are warmed, rubbed or exercised the abnormal feeling soon passes. It is a temporary condition creating no permanent disability nor connecting it with any known disease. The cause is mechanical irritation of the skin, continued muscular contraction of a cramping nature and low temperature.

The latter is the most important, for the condition occurs in winter only. It cannot be attributed to the pneumatic tools alone, for it does not appear in summer when these tools are most used and it affects also stone workers who chisel and mallet only.

Suggestions to prevent occurrence of the ailment are to keep the tool warm. An enlargement and covering of the chisel shank would also constitute a marked improvement by making it possible to hold the chisel without cramping the hand. Gloves help and the disorder diminishes if the workman discontinues the prevalent practice of blocking the exhaust with the thumb or finger of the right hand forcing a draft of cold air along the chisel to the fingers of the left hand.—Engineering News-Record.

Random Comments on the Issues of the Day

California Conditions

A circuit of the west coast cities by the editor of ROCK PRODUCTS shows that they are enjoying a long delayed general building boom. Cement and lime plants are quite generally behind in filling orders and have about all the business in sight that they can handle. The railway switchmen's strike very seriously handicapped most of the plants and for several weeks a large proportion of the different plants' production was shipped by motor trucks to distances ranging up to 100 miles or more.

The labor situation is worrying producers even more than the railways. Labor prices range from $3.50 per eight-hour day in southern California to $6 per day in the northern part of the state. The southern labor is largely Mexican, while farther north it is mostly Italian and Greek. There is not labor enough to go around and the men rotate from plant to plant in answer to additional inducements or more attractive living conditions. Several operators have to run bus lines to the nearest "movie" centers, for their laborers will not live in isolated communities any longer.

Selling prices are favorable to producers here as almost everywhere else at the present time. Costs continue to mount, however, the largest factor other than labor being fuel. All of the west coast plants burn crude oil, and there was formerly a considerable margin in the use of this fuel over coal, but now the more rapidly advancing price of petroleum is making more than one of the producers consider substituting coal in place of oil.

During the war it would have been mighty poor picking for the cement industry of the coast but for its potash by-product. Now there is difficulty disposing of the potash for chemical purposes, only one of the coast plants at present having any of this business. However, the other plants are building up a considerable trade in "lime-potash fertilizer," made from the raw dust, by direct sale to farmers.

The lime industry of the coast suffers from Canadian competition, the material being brought in by water transportation at a 5 per cent duty, based on the manufacturers' valuation. Right now the demand for lime far exceeds the supply and this competition is not serious. Nevertheless every effort is being made to have the tariff amended to exclude this Canadian product.

The mineral aggregate industry is on a firmer and more satisfactory basis than it has ever been. The three largest producers of the Los Angeles district have recently combined into a single operating and selling organization. Owing to wonderfully extensive deposits of gravel and boulders there is very little chance for quarry crushed stone to come into this market. Prices range from 50 cents to $1 per ton f. o. b. plant for both sand and stone, so that this section of the country is still considerably below the general level of mineral aggregate prices for the country as a whole.

In the San Francisco district there is sand, gravel, crushed boulders and crushed quarry stone. Three of the largest producers in this district have just united under one operating and selling organization which embraces five plants. Prices here range slightly higher than in the Los Angeles district, about 75 cents per ton being the plant price for sand, with crushed stone ranging up to $1.25 per ton. Ballast contracts for crushed quarry stone as low as 50 cents per ton are still in force.

California is contemplating the expenditure of $40,000,000 of state highway money, while all the counties are active in road building. Concrete is the predominating type of road, although most of the concrete roads are carpet-coated with asphalt or oil and sand.

Pumping Limitations

The article elsewhere in this issue on a sand and gravel plant operation with widely detached units is an example rather of how not do it than an example of successful practice. Nevertheless it is believed that the description of the plant, even though it has ceased to exist in the form illustrated, will prove of much interest and value to sand and gravel plant operators.

Undoubtedly the weakest feature of the plant as a hydraulic or pumping proposition was the very long pipe line to the screening unit and car loading bins. Not only was this pumping main excessively long, but its rise was greater than ordinarily attempted. The operation of so long a pipe line and its maintenance under the severe service required of it must have presented very serious difficulties.

Some pumping plants fail to operate economically for lack of experience in dredging on the part of the operators or from faulty or improper layouts. However, the plant referred to had for its operator one of the most experienced dredging contractors in the Northwest. The details, arrangement and special equipment show much originality and ingeniousness in the attempt to overcome the obstacles.

The abandonment of the hydraulic method in this case was for the reason, apparently, that the limit of economical sand and gravel pumping was passed both in the length and elevation of the pipe line. There is a point where the cheapness of the hydraulic method of conveying is offset by the burden of handling 80 to 95 per cent of water necessary to carry the material. Opinions as to what this limit is are not very easily obtainable, and the experience of other producers would be valuable.

Commercial Explosives—V

(Prepared by Engineering Department of the National Safety Council)

In all work where there is blasting, special precautions should be taken to make sure that all workmen are out of danger before shots are fired. It is the practice in many operations, and recommended for all, that the entire handling and firing of explosives is done by special men called shot firers, who are carefully selected and trained for their work. Special shot firers fully understanding the dangers of explosives are more careful than the ordinary miner or operator and accidental explosions are much less numerous.

Operators should stay away from the face for at least five minutes after a shot has been fired. This will give time for the removal of poisonous gases and the settling of excessive dust. If a shot fails to go off when fired electrically, at least five minutes should elapse before anyone returns to the face. If a shot was to be fired by a fuse or squib operators should wait at least half an hour.

It is not safe practice to use two kinds of explosives nor more than one type of detonator in the same hole. The explosion rate of different grades and different kinds of explosives and detonators vary, and a combination might result in much of their effectiveness being lost. The rapid explosion of one may hurl the other from the drill hole to expend its energy on the atmosphere or working place.

Explosives should never be handled by men carrying open lights. Excellent portable electric lamps have been designed for the use of miners and others and they should be used whenever a portable light is needed.

No one should carry ordinary matches into a quarry or near any operation where explosives are handled. Some men, such as shot firers, must have matches to light fuse or squibs, but in all cases these matches should be of the safety, strike-on-the-box type.

As has been stated elsewhere, detonators should never be stored in the same building nor carried in the same container with other explosives. New types of detonator containers have been devised which prevent the detonators from coming into contact with metal or with one another.

Never withdraw a shot that has misfired. A new hole should be drilled at least two feet away and parallel to the old one and both shots fired at the same time.

No one should take more than one day's supply of explosives with him into a quarry or to his working place. Five pounds is probably the maximum. This he should carry in a special canister, made of fiber or wood.

Old boxes and other containers that have held explosives are liable to be stained with nitroglycerine and should be destroyed at once. This is best done by piling them loosely in an open field, saturating them with kerosene, then applying a flame by a train of paper.

Care should be exercised in handling explosives when near electric wires, especially if the explosives are in a metal container. It is best to shut off the current when near electric wires. Explosives should be carried in a closed fiber or wooden box which is kept locked when not in use. It is not a safe practice to allow men to ride in the same car, train of cars or any carrier used to transport explosives.

Unloading Cars of Explosives

IT IS QUITE UNCOMMON to have a car of explosives arrive in damaged condition, but where the contents are found to be damaged, and cases are broken or otherwise in improper condition the matter should be reported to the transportation company, and the condition of the damaged cases should be carefully determined. If there is evidence that the roof of a car has leaked it is always advisable to examine the condition of the cases of explosives under the leak quite carefully. Nitrostarch explosives when very wet become insensitive and difficult to explode, while nitroglycerin explosives under the same conditions tend to "leak" nitroglycerin, and this free nitroglycerin is of course far more dangerous than is the nitroglycerin in absorbed condition in the original explosive. Cases of explosives which show exudation of nitroglycerin should be handled with the most extreme care, and every precaution should be used to avoid any friction, or any jar or blow that might be sufficient to cause an initial explosion which would undoubtedly communicate at once to the entire lot of explosives.

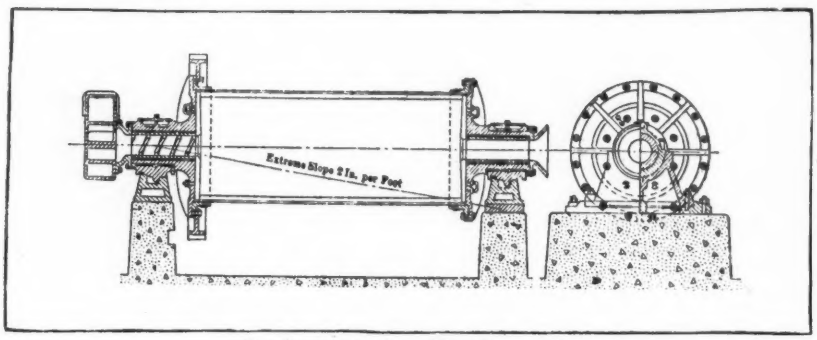
In unloading a car of explosives, just as in handling the cases of explosives in all subsequent operations, care should be taken to avoid unnecessary rough handling. It is true that cases are on record where boxes of dynamite have fallen in quarries for a vertical distance of 100 feet or more without explosion, and it is also true that railroad accidents have occurred in which cars loaded with explosives have been literally torn to pieces without explosion resulting. It is just such facts as these that make it so difficult for the average user of explosives to hold a proper mental conception of the degree of care which should be used in handling explosives, and to draw a clear distinction between that over-cautiousness which leads to a general fear of explosives on the one hand, and such careless handling on the other hand as amounts to true foolhardiness.

NEW MACHINERY AND EQUIPMENT

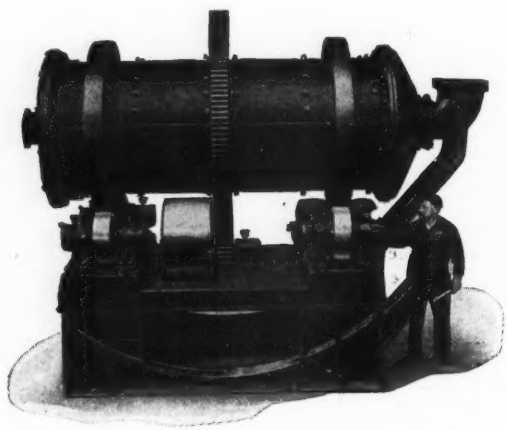
New Grinding and Mixing Mill

THE ROD MILL described by W. H. Crume (for grinding sand) in ROCK PRODUCTS, March 27, p. 39, is illustrated below. This type of mill has been used quite extensively in the mining industry, but is new to rock products producers.

The Marathon mill, made by the Johnson Engineering Works, Chicago, Ill., is a tube mill in which the grinding is done by steel rods instead of steel balls or pebbles. This mill also has special features, the principal one being that it can be tilted to different inclinations and the capacity and fineness of grinding governed accordingly.



Section through a Marathon mill



Details (above) and view (below) of Marathon rod mill
Note the device for adjusting the inclination of the mill

The advantages claimed for the Marathon mill are best set forth in a paper read by A. P. Watt, metallurgist of the St. Louis Smelting & Refining Co., before the American Institute of Mining Engineers in 1917. In this paper Mr. Watt said:

"The principle of the Marathon mill is different from that of a ball mill. The crushing in the Marathon is done on a line contact, while with the ball mill it is done on a point contact. The Marathon works on a positive principle; a ball mill works on a non-positive principle.

"Due to the fact that cylinders, and not spheres, are used as the crushing media, a Marathon will contain in the same volume 50 per cent greater weight of metal than a ball mill. A ball mill to contain weight of metal equal to that of a Marathon, requires to be either 50 per cent longer or else of greater diameter. As a ball mill is not efficient in long sizes, recourse would be taken to a ball mill of greater diameter. But such a step demands more power, as the center of gravity of the mass of balls is farther from the center of the mill than is the center of gravity of the rods in a Marathon.

"These two points constitute the two principal advantages of the Marathon over a ball mill: the line contact gives positive crushing, while the substitution of rods for balls permits a smaller horsepower to be used for equal weight of crushing metal. Assuming that crushing is proportional to weight of crushing medium, the Marathon is more efficient on this score as well as operating on a more efficient crushing principle.

"With a Marathon, there is no probability of oversize finding its way through the mill, any more than if a particle were to pass through more than a hundred set of rolls in series, the spacing of each being slightly less than that of the preceding set. Eventually the particle would reach a set of rolls it could not pass without being crushed. This same condition exists in a Marathon—positive reduction of all particles larger than a prescribed size and a minimum of energy expended on sizes sufficiently fine."

Western Gravel Company Makes Los Angeles Gift of Land

THE LOS ANGELES ROCK AND GRAVEL CO., Los Angeles, Calif., the owners of all the land along the east bank of the Arroyo Seco between Avenues 35 and 57, have tendered to the city a gift of a strip of land 50 feet wide the entire distance, or approximately two miles, for the purpose of a boulevard.

President H. W. Hawley, of the gravel company states, through the Los Angeles Chronicle, that in addition to a free deed to the city, his company will do all the work and furnish all material, excepting cement to build a concrete wall on both sides of the Arroyo between Avenues 26 and 35. His company will also build a wall on the west bank of the Arroyo from Sycamore Grove to Avenue 57.

General News from Rock Products Markets

Pennsylvania Lime Manufacturer Expands

THE PENNSYLVANIA LIME PRODUCTS CO., Philadelphia, which has purchased from the William P. David Estate about forty acres of land, located at Bridgeport, Pa., including quarry, kilns and buildings, formerly leased and operated by Jacob L. Tyson, is planning extensive improvements. Repairs have been made to kilns, crusher and buildings and the transportation from the quarry has been changed with the addition of new electrical equipment. All of the plant equipment has been changed from steam to electric power, including electric motor hoists, drills, pumps, etc., in the quarry, also at the crusher and kilns.

The company will likewise erect a hydrating plant, manufacture hydrated lime, lump lime and crushed stone.

The plant is now operating and has not been closed down for any length of time. The severe weather has somewhat delayed contemplated improvements, but all new equipment is now on the ground and partly installed. It is expected that the improved plant will be in full operation by the middle of April.

The officers of the company are as follows: George Van Sciver, president; J. L. Durnell, vice-president; Horace D. Fry, secretary and treasurer, and F. W. Smith, superintendent.

Canadian Cement Manufacturer Expands

THE ONTARIO CEMENT CO., Ltd., which has acquired the physical assets of the late Ontario Portland Cement, Ltd., with plant at Bene Lake, is proceeding with the erection of an 800-barrel mill at Beachville, midway between Woodstock and Ingersoll. Here are located valuable deposits of clay and limestone sufficient to supply a 1,500-barrel mill for fifty years at least, and the property is admirably located for transportation and power.

Directors of the Ontario Cement Co., Ltd., include D. L. Adams, Adams Wagon Co., Ltd., Brantford; E. P. Watson, Watson Mfg Co., Ltd., Brantford; K. W. Harvey, Harvey Knitting Co., Woodstock, and George McCrae, formerly with the Ontario Portland Cement Co.

The company's prospectus states that building operations will commence as soon as weather permits, and it is expected that the plant will be in operation early in August. In the meantime the company intends opening the Blue Lake plant in order to take advantage of the present demand for cement.

Growing Field for Sand and Grits

THERE IS A growing field for the use of sand and grits in the cement products manufacture. Concrete block houses can now be built of attractive design, guaranteed moisture proof, and from 10 to 20 per cent cheaper in first cost than a frame house, due to high price of lumber and improved methods of block manufacture. Concrete block structures offer now a low first cost, low maintenance, low insurance, comfortable temperature during extreme hot and cold weather, artistic surroundings, and an aid to national conservation of our timber supply.

Concrete blocks require clean grits and sand for their proper manufacture. The concrete block industry in many places is promoting this type of construction vigorously and with considerable success. —Indiana Sand and Gravel Producers' Association News Letter.

May Develop Phosphate Field in Montana

MISSOULA, Mont.—The development of phosphate fields near the Northern Pacific Railway between Garrison and Gold Creek on a large scale is being planned, negotiations now being under way for building a branch railroad line into the phosphate country, according to the Missoula Record-Herald.

Approximately five miles of railway must be built into the region where the phosphate is found. Officials of the Northern Pacific desire that the owners and promoters undertake the work themselves, feeling that the transportation system does not care to bother with the matter.

The Clifton, Toole & Applegate Co., railroad constructing engineers, recently made a survey of the grading project involved in the work and as a result of this survey something definite may develop within a short time in the matter. The phosphate will be marketed for fertilizer purposes.

Big Michigan Gravel Company Formed

THE GRAND RAPIDS GRAVEL CO., Grand Rapids, Mich., is the name of a new company which has purchased the properties of both the Standard Builders' Supply Co. and the Battje's Fuel & Material Co. The total producing capacity of the new company is 1,500 cu. yds. of washed sand and gravel per day.

The Grand Rapids retail trade will be taken care of by a fleet of motor trucks operating from the Wyoming plant. An operating office has also been established at this pit so that the retail trade may be cared for very quickly. The trucks will also be operated from this office as a headquarters.

The plant at Lamar will be almost entirely devoted to the carload business. Both plants are, however, within three miles of Grand Rapids and located on the Pere Marquette Railroad.

The officials of the new company are: W. J. Breen, president; N. H. Battjes, vice president; H. N. Battjes, secretary, and D. D. Battjes, treasurer.

California Highway Construction Will Continue Full Speed

HIGHWAY CONSTRUCTION work in California will be continued during the summer months, according to word received by President Percy E. Towne of the California State Automobile Association.

The board of control and Governor Stephens, with whom the association had filed a protest following publication of a report that highway work would be suspended, are now in conference.

State Highway Engineer A. B. Fletcher has assured the association that a way will be found to continue the work despite the condition of the bond market.

Judging from the steady increase in building permits taken out during the last few weeks, spring building activities have opened in real earnest in many of the cities, in spite of the present high prices. Altogether the outlook for an active spring in building and business is most promising. Many of the municipalities have started on their old-time stride of street improvements which were practically stopped by the war.

Billion Voted for Road Work In Counties and States

ACCORDING TO FIGURES recently compiled by the Portland Cement Association, a summary of state and county bond issues for road-building purposes as of March 1, 1920, indicates that there was authorized during 1919 and so far in 1920 $635,641,729.

For the remaining months of 1920 elections in the states and counties of the states are to be held which will determine whether an additional $391,253,800 is to be appropriated for road-building purposes. Therefore, the total, including the amount of money authorized and that proposed, is $1,026,895,529. Most of the elections proposing additional state expenditure will be held in November.

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton. F. O. B., at producing plant or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:			1.40 per net ton, all sizes			
Buffalo, N. Y.						
Burlington, Vt.	1.00	.....	2.50	2.00	2.00	.....
Chaumont, N. Y.	.....	1.75	1.65	1.35	1.25	1.25
Coldwater, N. Y.	1.80	1.80	1.80	1.65	1.65	2.00@2.40§
Limekiln, Md.	1.25	2.10	2.00	1.75	1.40	1.25
North Leroy and Akron, N. Y.	1.00	1.00	1.00	1.00	1.00	1.00‖
Utica, N. Y.	1.00		All other sizes 1.50			
CENTRAL:						
Alden, Ia.	.70	.70	1.35	1.35	1.35	1.35
Alton, Ill.	2.00	1.50	1.50	1.50	1.50	.....
Bettendorf, Ia.			1.50 per cu. yd., all sizes			
Buffalo, Ia.	.90	1.35	1.45	1.25	1.25	.....
Chicago, Ill.	1.20	1.60	1.30	1.20	1.30	1.20
Cincinnati, Ohio	.....	2.00	2.00	2.00	.....	.....
Cleveland, Ohio	.....	2.40	2.20	2.20	.....	.....
Davenport, Ia.	1.50*	1.50*	1.50*	1.50*	.....	.....
Detroit, Mich.	.....	2.40	1.70	1.60	.....	.....
Dundas, Ont.	.75	1.50	1.50	1.35	1.25	1.20
Elmhurst, Ill.	1.00@1.25	1.00@1.25	1.00@1.25	1.00@1.25	1.00@1.25	1.00@1.25
Ft. Wayne, Ind.	1.60	1.90	1.90	1.80	1.60	1.60
Greencastle, Ind.	1.50	1.25	1.10	1.00	1.00	1.00
Hull, Canada	2.50	2.30	2.50	2.10	2.00	1.75
Illinois, Southern	2.00	1.50	1.50	1.50	1.50	.....
Krause, or Columbia, Ill.	1.80	1.30	1.50	1.40	1.30	1.30
Laumon, Wis.	1.25	1.25	1.25	1.25	1.25	1.25
Lima, Ohio	1.40	1.40	1.40	1.40	1.40	1.40
Mansfield, Ohio	1.70	2.20	2.00	1.90	1.70	1.70
Mayville, Wis.	.90@1.00	1.35@1.50	1.10@1.20	1.10@1.20	1.10	1.10
Oshkosh, Wis.			1.40 per ton, all sizes			
River Rouge, Mich.	1.25	1.50	1.50	1.50	1.50	1.50
St. Louis, Mo.	.60	1.60	.....	.....	.....	.....
Stone City, Ia.	.80	.....	1.60	1.50	1.40	.....
Toledo, Ohio, f. o. b. cars	1.60	2.10	1.90	1.80	1.60	1.60
Toronto, Canada	1.55	2.25	2.25	2.25	2.05	2.00
Winnipeg, f.o.b. cars	2.50*	1.85*	2.85*	2.50*	.....	.....
SOUTHERN:			These prices include 90c freight			
Brooksville, Fla.	1.00	.....	.....	3.00	.....	.....
Cartersville, Ga.	.....	2.75	2.75	2.75	2.75	2.75
Chickamauga, Tenn.	1.50	1.75	1.75	1.75	1.75	1.75
El Paso, Tex.	1.00	1.00	1.00	1.00	1.00	1.00
Fort Springs, W. Va.	1.25	1.45	1.85	1.75	1.50	1.40
Mascot, Tenn.	.....	1.50	1.50@1.75	1.50@1.75	1.50@1.75	.....
Memphis Jct., Ky.			1.10@1.35, all sizes			
New Braunfels, Tex.	.60	1.75	1.65	1.50	1.50	1.50
WESTERN:						
Atchison, Kans.	.50	2.00	2.00	2.00	1.90	1.90
Blue Springs and Wymore, Neb.	.25	1.75	1.75	1.65	1.55	1.50
Kansas City, Mo.	.60	2.00	.....	.....	.....	.....
Mankato, Minn.	.....	.....	.....	1.75	1.50	.....

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Bernardsville, N. J.	2.00	2.00	2.00	1.80	1.50	.....
Branford, Conn.	.80	1.75	1.65	1.45	1.25	.....
Birdsboro, Pa.	1.40	1.90	1.80	1.60	1.40	1.40
Bound Brook, N. J.	2.00@2.10	2.20@2.30	2.00@2.10	1.80@1.90	1.40@1.50	.....
Castro Pt., Richmond, Cal.	.50*	.....	1.50*	1 50*	1.40*	.....
Dresser Jct., Wis.	.75	2.45	2.45	2.15	2.00	2.00
Duluth, Minn.	1.00	2.25	2.00	1.50	1.50	.....
E. Summit, N. J.	2.10@2.20	2.35@2.50	2.10@2.20	1.80@1.90	1.75@1.80	.....
Glen Mills, Pa.	1.00	1.35	1.70	1.55	1.35	1.35‖
Meriden, Conn.	.80	1.75	1.75	1.50	1.40	.....
Millington and Paterson, N. J.	1.80	2.20	2.00	1.80	1.60	.....
New Britain, Conn.	.80	1.30	1.25	1.20	1.00	.....

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Dundas, Ont.—Flint	1.10	1.10	1.10	1.10	1.10	1.10
Little Falls, N. Y.—Syenite	.80	1.20	1.40	1.20	1.20	1.20‖
Mayville, Wis.	.90@1.00	1.10@1.25	1.10@1.25	1.10@1.25	1.10@1.25	1.10@1.25
Middlebrook, Mo.—Granite	4.00	2.00	2.00	.....	.....	1.50‡
Portland, Maine—Granite	1.50	.....	.....	1.35	1.25	.....
Roseburg, Ore.	.....	1.50	1.25	1.05	1.00	1.00
Stockbridge, Ga.—Granite	.50	2.00	1.90	1.75	1.75	.....
White Haven, Pa.—Sandstone	.85	1.20	1.40	1.20	1.20	1.20‖
Granite	1.25	.....	1.50	1.50	1.50	.....

*Cubic yard. †Agrl. lime. ‖R. R. ballast. §Flux. ‡Rip-rap. a 3-inch and less.

Agricultural Limestone

EASTERN:

Coldwater, N. Y.—Analysis, 56.77% $CaCo_3$, 41.74% $MgCo_3$—70% thru 200-mesh, 95% thru 40-mesh; bags, $5.00; bulk 3.25

Chaumont, N. Y.—Analysis: $CaCo_3$, 92 to 98%; $MgCo_3$, 1.51%—(Thru 100 mesh); sacks, 4.00; bulk 2.50

Grove City, Pa.—Analysis: $CaCo_3$, 94.75%; $MgCo_3$, 1.20%—(70% thru 100 mesh); 80 lb. ppr., 4.60; bulk 3.25

Grove, Md.—90% thru 4 mesh; bulk 3.00

Hillsville, Pa.—Analysis, $CaCo_3$, 96% (90% thru 100 mesh); sacks, 4.50; bulk 2.75

Jamesville, N. Y.—68% thru 100 mesh; 95% thru 50; 100% thru 20. Sacks, 3.75; bulk 2.25

Syracuse, N. Y.—Analysis, 90% carbonates (50% thru 100 mesh, 90% thru 50 mesh); sacks, 3.50; bulk 1.75

Walford, Pa.—(70% thru 100 mesh; 85% thru 50; 50% thru 50; 100% thru 4); sacked, 4.25; bulk 2.75

West Stockbridge, Mass.—Analysis: Combined carbonate, 95%—33% thru 200 mesh; 66% thru 100; 100% thru 40. Bulk 2.85

Williamsport, Pa.—Analysis, $CaCo_3$, 88-90%; $MgCo_3$, 3-4%—(50% thru 50 mesh); sacks, 4.50; bulk 3.00

CENTRAL:

Alden, Iowa—Analysis, CO_3, 99.16%; bulk ..... .80

Alton, Ill.—Analysis: $CaCo_3$, 96%; $MgCo_3$, 0.75%—50% thru 4 mesh 2.50

Bedford, Ind.—(90% thru 10 mesh) Analysis, $CaCo_3$, 98.5%; $MgCo_3$, 0.5% 1.75

Belleville, Ont.—Analysis, $CaCo_3$, 90.9%; $MgCo_3$, 1.15% (45 to 50% thru 100 mesh; 61 to 70% thru 50 mesh); bulk 2.50

Chicago, Ill.—Analysis, $CaCo_3$, 53.63%; $MgCo_3$, 37.51%—90% thru 50 mesh 1.00

Columbia, Ill., near East St. Louis (¼" down) ..... 1.25@1.80

Ellettsville, Ind.—Analysis, Carbonate, 98% 2.00

Elmhurst, Ill. — (Analysis, $CaCo_3$, 35.73%; $MgCo_3$, 20.69%) 50% thru 50 mesh 1.25

Greencastle, Ind.—(Analysis, $CaCo_3$, 98%) 50% thru 50 mesh 1.75

Howenstein, O.—100% thru 10 mesh; 59% thru 50; 39% thru 100 ..... 2.75@3.00

Kansas City—(50% thru 50 mesh) 2.00

Lannon, Wis.—(90% thru 50 mesh) Analysis, 54%, $CaCo_3$; 44%, $MgCo_3$ 2.00

Marblehead, O.—(Analysis: $CaCo_3$, 95.33%) 100% thru 100 mesh, sacks, 4.75; bulk 2.75

McCook, Ill.—Analysis, $CaCo_3$, 54.10%; $MgCo_3$, 45.04%—100% thru ¼" sieve; 78.12% thru No. 10; 53.29% thru No. 20; 38.14% thru No. 30; 26.04% thru No. 50; 16.27% thru 100 ..... .90@1.00

Milltown, Ind.—Analysis, $CaCo_3$, 94%; $MgCo_3$, 3%—(100% thru 4 mesh) 1.50

Montrose, Ia.—(90% thru 100 mesh) 1.25

Muskegon, Mich.—(90% thru 50 mesh) Analysis, $CaCo_3$, 53.35%; $MgCo_3$, 43.27% 2.50

Piqua, O.—Analysis: $CaCo_3$, 82.8%; $MgCo_3$, 8.2%; neutralizing power in terms of calcium carbonate, 95.3%—50% thru 100 mesh; bulk ..... 2.75@4.50

Stolle, Ill. (near East St. Louis on I. C. R. R.)—(Thru ¼" mesh) Analysis, $CaCo_3$, 89.61 to 89.91%; $MgCo_3$, 3.82% 2.00

St. Paul, Ind.—Analysis, $CaCo_3$, 85%; $MgCo_3$, 12% 1.50

Stone City, Ia.—Analysis, $CaCo_3$, 98% (50% thru 100 mesh) ..... .80

Toledo, O.—Analysis, $CaCo_3$, 52.72%; $MgCo_3$, 43%—(20% thru 100 mesh); 30% thru 50; 80% thru 100; 100% thru 5/32 screen) 1.80

Whitehill, Ill.—Analysis, $CaCo_3$, 96.12%; $MgCo_3$, 2.50%—50% thru 100 mesh 2.00

(Continued on next page.)

Agricultural Limestone

(Continued from preceding page.)

SOUTHERN:

Cartersville, Ga.—Analysis: 96 to 98% combined carbonates — All thru 10 mesh with all dust in 2.75

Claremont, Va. (Marlime) — Analysis, 90.94% $CaCo_3$, 0.31% P., 1.36% Mg., 0.37% K.; bulk 4.50
100 lb. ppr. bags 6.00
100 lb. cloth bags 6.50

Dittlinger Tex. — Analysis, $CaCo_3$, 99.09%; $MgCo_3$, .04%.
90% thru 100 mesh 2.00
90% thru 4 mesh 1.00

Grovania, Ga.—Analysis, $CaCo_3$, 95%; $MgCo_3$, none—50% thru 100 mesh 2.50

Hopkinsville, Ky.—Analysis, 94.6 to 98.1% $CaCo_3$—Bulk 2.00

Linnville Falls, N. C. — Analysis, $CaCo_3$, 54%; $MgCo_3$, 42%—50% thru 100 mesh; sacks, 4.00; bulk 2.50

Marion, Ga.—Analysis, 90% $CaCo_3$—(50% thru 100 mesh) 2.00

Memphis Jct., Ky.—(Analysis, $CaCo_3$, 95.31%; $MgCo_3$, 1.12%); average price, ½ in. down 2.00

Mascot, Tenn.—Analysis, $CaCo_3$, 52%; $MgCo_3$, 38%.
(80% thru 100 mesh) 2.75
(All thru 10 mesh) 2.25
(80% thru 200 mesh) 4.00
Paper bags, $1.50 extra per ton; burlap, 2.00 extra per ton.

Maxwell, Va. 2.50

Mountville, Va.—Analysis, $CaCo_3$, 76.6%; $MgCo_3$, 22.8%—100% thru 20 mesh; sacks, 5.50; bulk 4.50

Ocala, Fla. — Analysis, $CaCo_3$, 98%—(75% thru 200 mesh) 4.50

Tyrone, Ky.—Analysis, $CaCo_3$, 93%; $MgCo_3$, 6%—90% thru 4 mesh 2.25

Winnfield, La.—(50% thru 50 mesh) 3.00

WESTERN:

Cement, Calif.—50% thru 50 mesh 4.00

Colton, Calif.—Analysis: $CaCo_3$, 95%; $MgCo_3$, 1½%; bulk, 2.50; bags, Sacks, 15c extra, returnable. 2.50

Kansas City, Mo., Corrigan Sid'g—50% thru 50 mesh; bulk 1.35

Terminous, Calif.—Analysis, 94% $CaCo_3$, 1.4% $MgCo_3$—(60% thru 200 mesh; 90% thru 100 mesh; 100% thru 40 mesh); sacks, 4.50; bulk 4.00

Miscellaneous Sands

Silica sand is quoted washed, dried and screened, unless otherwise stated.

GLASS SAND:

Berkeley Springs, W. Va. ..... 2.25@2.75
Special hand selected rock 2.50
Bridgeton, N. J. 2.00
Cedarville and South Vineland, N. J.—
Glass, damp 2.00
Glass, dry 2.50
Gray Summit, Mo. ..... 2.00@2.50
Guion, Ark.—Carlots 2.00
Hancock, Md.—Damp 2.00
Klondike and Pacific, Mo.:
Contracts 2.00
Carlots 3.00
Mapleton, Pa. 3.00
Glass, damp 2.50
Massillon, Ohio 3.00
Michigan City, Ind. ..... .50
Millington, Ill.—Contracts 2.00
Mineral Ridge, O. 3.50
Montoursville, Pa.—Green, washed 1.50
Oregon, Ill.—Large contracts 2.00
Open market 2.50
Ottawa, Ill. ..... 2.00@2.50
Robinson, Md., washed, screened, not dried 2.00
St. Marys, Pa.—Green 2.50
Sands, Elk Co., Pa.—Selected, green 2.75
Thayers, W. Va.—Washed 2.75
Unwashed 2.50
Utica, Ill. ..... 1.75@2.50

FOUNDRY SAND:

Albany, N. Y.—Molding coarse 2.00
Molding fine 2.75
Brass molding 2.75
Allentown, Pa.—Core ..... 1.50@1.75
Molding coarse 1.50
Arenzville, Ill.—Molding fine ..... 1.75@2.00
Beach City, Ohio—Core 2.50
Green silica sand (not dried) 2.25
Washed silica sand (not dried) 2.50
Sand blast ..... 2.75@3.50
Bowmantown, Pa.—Core 1.50
Molding, coarse 2.00
Bridgeton, N. J.—Core 2.00

(Continued on next page)

Wholesale Prices of Sand and Gravel

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine sand, 1/10 inch down	Sand, ¼ inch and less	Gravel, ½ inch and less	Gravel, 1 inch and less	Gravel, 1½ inch and less	Gravel, 2 inch and less
EASTERN:						
Ambridge, South Heights, Pa.	.....	1.30	.....	1.30	1.00	1.00
Attica, N. Y.	.75	.75	.75	1.00	1.00	1.00
Farmingdale, N. J.	.68	.48	1.50	1.35	1.35	1.30
Hartford, Conn.	.90	.....	1.25	1.15	1.15	1.15
Ludlow, Mass.	.....	.75	.....	.....	1.10	1.00
Morristown, N. J.	.60	.60	1.75	.....	1.40	1.35
Portland, Me.	1.00	.50@ .60	.....	1.35	1.25	.....
Washington, D. C., f. o. b. wharves on cars	.75	.75	2.00	1.40	1.20	.....
CENTRAL:						
Alton, Ill.	.60@ .75	.60@ .75	1.50@4.50	1.30	1.20	1.20
Attica, Covington, Silverwood, Ind.	.85	.85	.85	.85	.85	.85
Barton, Wis.	.85	.70	1.00	.80	.80	.80
Beloit, Wis.			.60 sand, 1.00 gravel			
Chicago, Ill.	.....	1.20@1.50	.....	1.20@1.50	.....	.....
Columbus, Ohio	.....	.70	.70	.80	.80	.70
Covington, Ind.	.75	.75	.85	.75	.75	.75
Des Moines, Ia.	.75@1.00	.75	1.65	1.65	1.50	1.50
Earlestead (near Flint), Mich.	.60	.60	.....	.....	.....	.70
Eau Claire, Wis.	.....	.60@ .70	.....	1.25@1.50	.....	1.00@1.25
Elgin, Ill.	.....	.80	1.00	.80	.80	.80
Ft. Dodge, Ia.	1.50	1.40	2.30	2.30	2.30	2.30
Ft. Jefferson, Mechanicsb'g, O.	.70	.60	.60	.80	.70	.70
Grand Rapids, Mich.	.....	.60	.....	.90	.83	.....
Grass, Mich.	.....	1.00	1.60	1.20	1.20	1.20
Greenbush, Mich.	.50	.80	1.00	1.25	1.25	.....
Indianapolis, Ind.	.60	.60	.....	1.50	.75	.75
Mason City, Ia.	1.00	.90	2.00	1.85	1.75	1.65
Milwaukee, Wis.	1.25	1.25	1.35	1.35	1.35	1.35
Minneapolis, Minn.	.50	.50	2.00	2.00	1.75	1.75
Oxford, Mich.			(60-40 mix, .95 per ton)			
Pittsburgh, Pa.			(Sand, 1.30; gravel, 1.00)			
Reton, Wis.	.....	.65@ .70	.....	.....	.70@ .75	.....
St. Louis, Mo., f.o.b. cars	1.50	1.55	.....	1.50	.....	1.45
Summit Grove, Ind.	.85	.85	.85	.85	.85	.85
Terre Haute, Ind.	.85	.85	.....	.90	.90	.85
Toledo, Ohio	.75	.75	.....	.....	.....	.....
Yorkville, Moronts, Oregon and Ottawa, Ill.	.70	.80	.90	.80	.80	.75
SOUTHERN:						
Flomation, Ala.	.....	.80	.....	.....	1.80	.....
Knoxville, Tenn.	1.15	1.15	1.50	1.50	1.50	1.40
Lake Weir, Fla.	.....	.60	.....	.....	.....	.....
Lincoln, Neb.	.90	.90	2.20	2.20	.....	.....
Macon, Ga.	.....	1.00	.....	.....	.....	.....
Memphis, Tenn.		(Sand, 1.25 per cu. yd.; gravel, 1.50 per cu. yd.)				
N. Martinsville, W. Va.	.....	1.10@1.20	.....	.....	.....	.90@1.00
Pelzer, S. C.	.80	.80	.....	.....	.....	.....
Pine Bluff, Ark.	1.20	1.20		1.30 all other sizes		
Roseland, La.	.....	.35	.....	.....	1.25	.....
Thomas, La.	.60	.....	.....	.....	.....	1.75
Tulsa, Okla.	.....	.70	.....	.....	.....	.....
Waco, Texas	.70@ .80	.70@ .80	.....	.....	.....	1.10
WESTERN:						
Essex, Humboldt Co., Calif.	.....	1.35	1.35	1.35	1.35	1.35
Grand Rapids, Wyo.	.50	.50	.85	.85	.80	.80
Kansas City, Mo.		(Kaw River sand, car lots, .75 per ton, Missouri River, 1.50)				
Niles, Calif.	.80@1.00	.70@ .85	.75@1.00	.70@1.00	.70@1.00	.70@1.00
Saratoga, San Jose, Calif.	.....	.60@ .75	.60@ .70	.60@ .70	.60@ .70	.60@ .70
Seattle, Wash.	1.25	1.25	2.00	1.25	1.25	1.25
Vancouver, B. C.	.....	1.30*	.....	1.30*	.....	1.10*
Yorkville, Ore.	.60	.60@ .75	.70	.60@ .75	.60	.50@ .60

Bank Run Sand and Gravel

City or shipping point	Fine Sand, 1/10 inch down	Sand, ¼ inch and less	Gravel, ½ inch and less	Gravel, 1 inch and less	Gravel, 1½ inch and less	Gravel, 2 inch and less
EASTERN:						
Boonville, N. Y.	.60@ .75	.60@ .75	1.20	1.10	1.00	.90
Burnside, Conn.	.80*	.....	.....	.....	.....	.....
Fishers, N. Y.	.....	.85@1.00	.....	.....	.85@1.00	.....
Yardville, N. J.	.....	.50@ .75	.....	.....	.....	.....
York, Pa.	.....	1.10@1.30		(crushed rock sand)		
CENTRAL:						
Earlestead, (near Flint, Mich.)			.60 per yd.			
Ft. Jefferson, Mechanicsb'g, O.	.70	.60	.60	.....	.....	.....
Grand Rapids, Mich.	.....	.40	.....	.75	.80	.60
Greenbush, Mich.	.65	.....	.....	.....	.....	.....
Hersey, Mich.	.....	.....	.....	.60	.....	.....
Illinois, Northern	.....	.....	.....	.....	.....	.50@ .60
Janesville, Wis.	.....	.65	.....	.....	.75	.....
Lincoln, Neb.			Sand gravel mix, 1.30			
Oxford, Mich.			Including cobbles, $1.00 per yd.			
St. Louis, Mo., f.o.b. cars	1.60	1.60	1.60	1.60	1.60	1.60
Summit Grove, Ind.	.65	.65	.65	.65	.65	.65
Toledo, Ohio	.....	.....	.....	.....	.75	.....
Yorkville, Oregon, Moronts and Sheridan, Ill.	.....	.....	.....	.....	.....	.65
SOUTHERN:						
Albany, Ga.	.70@1.00	.....	.....	.....	.....	.....
Dudley, Ky. (Crushed Sand)	.....	1.05	.....	1.00	.....	.....
Lindsay, Tex.	1.00	.....	.....	.....	.....	.50@ .75
Thomas, La.	.....	.....	.....	.....	.....	.40@ .70
Valde Rouge, La.	.....	.....	.....	.....	.....	.60@ .75
Waco, Texas	.....	.....	.....	.....	.....	.95
WESTERN:						
Pueblo, Col.			River Run, .75* unscreened			
Saratoga, San Jose, Calif.	.....	.60@ .75	.60@ .70	.60@ .70	.60@ .70	.60@ .70
Yorkville, Ore.	.....	.40	.....	.....	.40	.....

* Cubic yard. B Bank. L Lake. || Ballast.

Crushed Slag

City or shipping point	Roofing	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:							
Bethlehem and Emaus, Pa.	2.50	.90	1.50	1.00	1.00	1.00	1.00
Buffalo, N. Y.	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Cleveland, Ohio.		.85		1.05	1.05	.95	.95
E. Canaan, Conn.	3.50	1.10	3.00	1.35	1.25	1.25	1.25
Erie, Pa.		1.25	1.25	1.25	1.25	1.25	1.25
Emporium, Pa.		1.25	1.25	1.25	1.25	1.25	1.25
Ensley, Ala.	2.05	1.00	1.25	1.25	1.25	1.00	.95
Hokendaugua and Donaghmore, Pa.	2.50	.90	1.50	1.00	1.00	1.00	1.00
Lebanon, Pa.	2.50	.85	1.50	.85	.85	.85	.85
Philadelphia Dist.	2.50	1.00	1.50	1.00	1.00	1.00	1.00
Pittsburgh, Pa., Dist.	2.05	1.15	1.50	1.15	1.15	1.15	1.15
Sharpsville, Pa.	2.00	1.20	1.60	1.20	1.20	1.20	1.20
CENTRAL:							
Chicago, Ill.	All sizes, $1.50, F. O. B. Chicago						
Detroit, Mich.	All sizes, 1.65, F. O. B. Detroit						
Ensley, Ala.	2.05	1.00	1.10	1.25	1.25	1.00	.95
Ironton and Jackson, O.	2.00	1.25	1.50	1.25	1.25	1.25	1.25
Toledo, O.	All sizes, 2.00, F. O. B. Toledo						
Youngstown, Dover, Hubbard and Leetonia, O.	2.00	1.20	1.60	1.20	1.20	1.20	1.20

Agricultural Lime and Hydrate

	—Agricultural Lime— Bulk	Bags	Per Cent CaO	Per Cent MgO	Agricultural Hydrate Bags
EASTERN:					
Adams, Mass.			98	38	8.00
Apollo, Pa.	3.25		95.14	1.44	
Bellefonte, Pa.	8.00		98.5	.72	11.50
Berkeley, R. I.		14.00	45	15	
Bridgeport, Pa.	7.50@9.00		55	44	9.00@11.00
Cavendish, Vt.	2.50 bbl. in car lots				
Cavetown, Md.	8.50				
Cedar Hollow, Devault, Rambo and Swedeland, Pa.	8.00	10.75 grd.	58	38	10.75
Chippewa, Pa.	6.00		78.67	1.33	
Farnams, Mass.	6.00	7.50	60	2	
Frederick, Md.	7.75		88	5 to 8	10.50
Grove City, Pa.	3.25	4.50	94.75	1.20	10.25
Grove, Md.	8.00				10.75
Highgate Springs, Vt.		8.00	85	2	
Hollidaysburg, Pa.	5.50@7.50		94.68		
Hyndman, Pa.	5.00	8.50	80.23	2.87	
Lime Kiln, Md.	8.00	10.75			10.75
Lime Ridge, Pa.	5.25@6.50		80.56-62.56	3.87-1.75	
Newburgh, N. Y.			57	38	8.00
New Castle, Pa.	3.50	4.50	47.6 to 50.4	0.62 to 1.12	
Paxtang, Pa.	5.50@7.00		60	12	
Rosendale, N. Y.	8.00	9.00	92	5	
Sandyville, O.					9.00
Union Bridge, Md.	8.50		73	1	10.75
Williamsport, Pa.	5.50	10.00	65 to 80	2 to 4	10.00
York, Pa.	8.00		90 to 95	2 to 7	10.75
CENTRAL:					
Alton, Ill.	10.50		94.0		
Delaware, O.			50.0	5-12	10.50
Forest, O.	7.50				
Knowles, Wis.		9.00	55	45	11.50
Manistique, Mich.	11.00		95	2	11.00
Mitchell, Ind.					12.50
Sheboygan, Wis.	5.50	8.50	58	40.5	
Springfield, Ohio			33.62	17.73	10.50
Woodville, Ohio			46-50	30-35	13.00
SOUTHERN:					
Blowers, Fla.	5.00	7.25	98.0		
Burns, Tenn.	9.50		96	0.54	13.00
Chippewa, Fla.	5.00		80.0	15.0	
Dittlinger, Texas		9.00@11.00	98.62	0.29	12.50@15.00
Erin, Tenn.	9.50		97.82	0.12	
Knoxville, Tenn.	2.50				14.00
Lushing, Va.	9.00	11.25	60	15	12.75
Maxwell, Va.	6.00	9.00	88	1.75	
Newala, Ala.	8.50@9.00		99.33		
Ocala, Fla.	4.00	6.00 pulv.	98½	(dry basis)	
Staunton, Va.	7.50	10.00	80.00	15.00	
WESTERN:					
Colton, Calif.	4.50		97	2	15.00
Kirkland, N. Mex.	12.00				
Oscas Island, Wash.		5.50			16.50
San Francisco, Calif.			96	0.33	15.00
Tehachapi, Cal.	6.00	8.00	96	2	

Miscellaneous Sands

(Continued from preceding page)

Cleveland, O.—Molding coarse	2.50
Brass molding	2.50
Molding fine	2.75
Columbus, O.—Core	2.00
Brass molding	2.50
Molding fine, steel molding	2.50
Conneaut, O.—Molding fine	2.75@3.00
Molding coarse	2.50@2.75
Delaware, N. J.—Molding fine	2.00
Molding, coarse	1.90
Brass Molding	2.15
Eau Claire, Wis.—Core	.70
Roofing gravel	2.25
Sand blast coarse	3.50
Sand blast medium, fine	3.00
Fleetwood, Pa.—Furnace lining	2.25
Franklin, Pa.—Traction	2.25
Brass molding	2.25
Molding fine, steel molding	3.00
Molding coarse, fine, green	2.25
Sand blast	5.00
Core	2.25
Greenville, Ill.—Molding coarse red	1.75@2.25
Guion, Ark.—Molding fine	2.00@2.25
Roofing	3.00
Stone sawing	2.50
Hancock, Md.—Core and brass mldg.	1.65
Hellam, Pa.—Core	2.00@2.50
Joplin, Mo.—Stone sawing, flint	1.25
Kansas City, Mo.—Missouri River core	.85
Klondike and Gray Summit, Mo.—Molding fine	2.00@2.50
Lake Weir, Fla.—Sand blast	.60
Mapleton, Pa.—Core, furnace lining, molding fine and coarse damp	2.50
Core, furnace lining, molding, fine and coarse, dry	3.00
Massillon, O.—Molding fine	3.00
Molding coarse	3.00
Traction	2.75
Furnace lining	3.00
Core	3.00
Michigan City, Ind.—Core, bank	.50@ .60
Traction	.50
Millington, Ill.—Core and furnace lining	2.50
Core, washed	1.50
Mineral Ridge, O.—Core, molding, sand blast, roofing, etc., washed screened (damp)	2.50
Montoursville, Pa.—Core	1.25@1.50
Traction	1.15@1.35
Brass molding	1.25
Ohio—Various points:	
Iron molding, fine	1.50@2.25
Iron molding, coarse	1.75
Brass molding, minimum	2.00
Oregon, Ill.—Core, furnace lining, molding fine, brass molding	2.50
Sand blast, molding coarse	3.50
Ottawa, Ill.—Core, furnace lining	2.50
Core	2.50
Roofing sand	2.00@3.00
Sand blast	5.00
Crude Silica sand	.75@1.00
Providence, R. I.—Molding fine	2.00
Molding coarse	1.90
Brass molding	2.25
Sand blast	3.00@4.00
Sugar Grove, Ohio—Core (dried and screened)	2.00
Traction	2.00
Thayer, Pa., Traction	2.00
Furnace lining, molding, coarse	1.25
Molding, fine	1.50
Core, washed	2.50
Core, green	2.00
Utica, Pa.—Core	2.00
Molding coarse, traction	2.50
Brass molding	2.75
Sand blast	3.50
Warwick, Ohio—Core, furnace lining, molding fine and coarse (dry and screened)	2.50@2.75
Core, furnace lining, molding fine and coarse (green)	2.25
Wedron, Ill.—Core, (crude silica)	.75@1.00
Molding fine, coarse	.75@1.00
West Albany, N. Y.—Molding fine	1.75@2.25
Molding coarse	1.50
Brass molding	1.75
Zanesville, Ohio — Molding fine and brass	2.00@2.50
Molding coarse	1.75@2.25

Gypsum, per Ton

Castalia, O.—Crushed, to cement mills	3.50
Ground, to cement mills	3.50
Land plaster	6.00
Bags extra—Jute, 3.00; ppr., 1.00 per ton.	
Fort Dodge, Ia., bulk	3.50
Garhutt, N. Y.—Land plaster, bags	7.50
Grand Rapids, Mich.—Crushed gypsum	4.50
Ground gypsum rock	9.00
Gypsumville, Man., Can. (crushed)	3.50
Oakfield, N. Y.	7.50
Sandusky, O.	6.00

Jute sacks, $3.00 extra; paper, $1.00 extra.

Ground Rock Phosphate

Centerville, Tenn.—B. P. L., 70%; ton, 2000 lbs. (90% thru 100 mesh)	9.00@10.00
Lump rock, 72% to 75%, B. P. L.	6.00@8.50
Centreville, Tenn.—B. P. L., 60%	7.00
B. P. L., 70%	9.00@10.00
Gordonsburg, Tenn.—2000 lbs. (90% thru 100 mesh)—B. P. L., 60%	6.00
B. P. L., 65%	7.00
B. P. L., 70%	8.50
B. P. L., 75%	12.00
Mt. Pleasant, Tenn.—(B. P. L. 68%) 13%	7.00
14%	8.00
Mt. Pleasant, Tenn.—B. P. L., 70%	9.00@10.25
Nichols, Fla.—Pebble, B. P. L., 68%	10.00
Wales, Tenn. (95% thru 100 mesh) (guaranteed 14% phosphorus equivalent)	7.00@8.25
Walls, Tenn.—B. P. L., 70.2%—	
To County Agri. Assns.	7.50
To others	7.75

Florida Soft Phosphate

Croon, Fla.—Ground pebble, 30%	16.00
Pulverized soft, 26%	17.50
Jacksonville (Fla.) District	10.00@12.00
(Add 2.50 for sacks)	
Phoslime, Fla. (in burlap bags, 100-200 lbs.)	15.00

General News from Rock Products Markets

Massachusetts Highway Program Totals Seven Million

FOR HIGHWAY CONSTRUCTION, and reconstruction and maintenance work the State of Massachusetts has approximately $7,000,000 to spend during the 1920 construction season. The project calling for the greatest expenditure will be, perhaps, that of the road from Orleans to Provincetown. A continuation of the Mohawk trail from Greenfield west will be of cement concrete construction and will cost near $350,000. The Northampton and Pittsfield road is to be improved with bituminous macadam, and with drainage and necessary bridges will cost approximately $300,000. The Newburyport Turnpike from Newburyport to Boston will receive attention this season, six more miles of bituminous macadam being scheduled for construction.

Improving Cement Blocks by Use of Hydrated Lime

AN IMPRESSIVE example of the use of hydrated lime in concrete construction was presented recently in the experience of a manufacturer of concrete blocks. He came into the offices of the National Lime Association with the report that he had been having much difficulty with the blocks manufactured by his concern, due to the necessity of working the material very dry. Many of the blocks broke in handling, the manipulation was slow, and further the blocks were so porous that they transmitted moisture and gave much trouble from this source in the structure. He said he had been told that the use of a little hydrated lime would eliminate much of this difficulty. The principle on which hydrated lime is used in concrete construction was explained to him and the proportions given. He returned to his factory to give its use a trial.

Recently he came back to report results and was indeed a happy man, as the use of hydrated lime had converted a rather doubtful business proposition into a shining success. He was enthusiastic over its effects. He reported that he was able to turn out many more blocks per day with the same force of labor; that the manipulation was very much simpler; that a less number of blocks were spoiled in stripping the molds; that the finished blocks were smoother; that they cured more quickly, and rang like a bell; that they were practically waterproof and therefore did not become moist in the building and further that he was getting a larger number of blocks from a given quantity of cement than formerly.—National Lime Association News Letter.

Associate Membership Created in Indiana Association

AN ASSOCIATE MEMBERSHIP has been created whereby members in good standing in other state sand and gravel producers' associations are eligible to membership in the Indiana association upon payment of $25 annually. This membership has the privilege of all meetings and benefits, but no vote.—Indiana Sand and Gravel Producers' Association News Letter.

Municipal Cement Plant Leased for Potash Manufacturing

THE LOS ANGELES, CALIF. cement plant at Monolith has been leased by the Public Service Commissioners to Fred A. Ballin of Portland, Ore., and his associates for a term of five years at a rental of $22,500 a year. Under the terms of the lease Mr. Ballin agrees to spend $150,000 in installing postash-making machinery at the plant. Work will start at once on improvements and the plant is expected to be in operation in about four months.

Aman Moore, one of Mr. Ballin's associates, said: "The plant will be the largest commercial potash manufactory in the world. We own deposits of feldspatoid rocks in the desert and near San Diego, and after alterations the plant at Monolith can handle about 75 tons a day of this rock, from which we hope to extract about 80 per cent pure potassium chloride, which gives a theoretical return of pure potash."

The leasing of the cement plant, which was recommended by the directors of the Chamber of Commerce, solves a problem with which the Public Service Commissioners have been struggling for two years. The plant was built at a cost of $800,000 to manufacture cement for the aqueduct. For the past seven years it has been idle and an expense of $6,000 a year to the taxpayers, with depreciation of $25,000 a year. The advocates of municipal ownership in the Council tried to stampede the city into taking the plant over for cement-making purposes, but the city's needs were too small to justify operating the plant, and the City Attorney rendered an opinion that the city could not manufacture cement for the open market.

Under the terms of the lease Mr. Ballin may bid a minimum of $450,000 for the plant one year from date, if the city offers it for sale. The City Council has under consideration the question of submitting the sale proposal to the voters at the next election.

Much Road Building Material Needed

IT IS ESTIMATED that the proposed road-building program in Minnesota this year will require about 667,000 tons of crushed rock or gravel, or nearly 20,000 carloads of aggregate.

Largely on account of a shortage of crushed stone or gravel 58 miles of road which were to have been built in 1919 were not completed. These roads are to be completed this year, while about 180 miles of new construction requiring crushed rock or gravel has been authorized. This makes a mileage of 250 scheduled for 1920.—Public Roads.

Hearings on Freight Rates for Building Material

THE INTERSTATE COMMERCE COMMISSION conducted hearings for five days beginning March 22 for the purpose of getting evidence on which to fix rates that would yield the railroads a return of 5½ per cent, as provided in the recent Esch-Cummins bill. It seems certain that this increase in rates is to be authorized sooner or later.

During the war rates on sand, gravel and other materials were placed excessively high. They were so fixed by the Railroad Administration in accordance with the government's policy to discourage construction and confine capital and cars to the manufacture and shipping of materials necessary to the prosecution of the war. In view of these "penalty" rates it would appear that no further increase should be made on these commodities.

In an interview with A. G. Gutheim, member of the car service commission of the American Railway Association, representing the railways, he stated that he understood there were several complaints in the files of the Interstate Commerce Commission in regard to freight rates on building materials; but no immediate action was contemplated. G. B. McGinty, secretary of the Interstate Commerce Commission, reported that there were no hearings now scheduled in regard to building materials.

Among the organizations which have filed complaints with the commission are the Hollow Building Tile Association, the Common and Face Brick Associations and the Sand and Gravel Association. In their complaints they have stated that rates on building materials were already too high.

There appears to be no immediate danger of an increase in building material freight rates and there may be hearings in the near future to reduce them.—The Bulletin.

Passed By The Screens

Incorporations

The Georgia-Carolina Gravel Co., Greenwood, S. C., has been organized with a capital of $150,000.

The White Haven Sand & Stone Co., Pittston, Pa., has been incorporated with a capital of $100,000.

The Delta Construction & Sand Co., Clarksdale, Miss., has been incorporated with a capital of $200,000.

The Hardin Quarry Co., Dunkirk, Ohio, has been incorporated with a capital of $30,000 by C. D. Brown.

The Moosie Sand Co., Philadelphia, Pa., has been incorporated with a capital of $12,000 by Thomas E. Walch.

The Spring Rock Sand Co., Scranton, Pa., has been incorporated with a capital of $5,000. The company was incorporated by F. P. Hamilton.

Henry McFarland is making extensive tests for gravel around Castleberry, Fla., with the view of putting in a $200,000 pump and steam shovel.

The Lafayette State Quarry, Newton, N. J., has been incorporated with a capital of $100,000. The incorporators are Levi Hershkovitz, Louis Hitkovitz and Sol Hershkovitz.

The Poughkeepsie Sand & Gravel Co., Poughkeepsie, N. Y., has been incorporated with a capital of $25,000. The incorporators are W. O. Lloyd, W. A. Shafer and C. J. Drake.

The Lufkin Rock Co., Corrigan, Texas, has been incorporated for the purpose of quarrying and crushing stone. The capital is $50,000 and L. Mitchell is secretary and treasurer.

The Carolina Fertilizer & Phosphate Co., Raleigh, N. C., has been incorporated with a capital of $2,000,000. The incorporators are W. N. Moore, N. T. Patterson and T. J. Norfleet.

The Bay State Granite & Marble Co., Boston, Mass., has been incorporated with a capital of $10,000. The incorporators are W. Herbits, president; D. A. Kriesfeld, treasurer, and S. H. Pierce.

The Highland Sand & Gravel Co., Boston, Mass., has been incorporated with a capital of $150,000. The incorporators are J. H. Messer, president; W. Corcoran, treasurer, and Robert Hathaway.

The Monolith Granite Co., Peekskill, N. Y., has been incorporated for a general quarry business. The capital is $250,000 and the incorporator is E. Schmidt, 738 Evergreen avenue, Brooklyn, N. Y.

The Limestone Products Co., Black River, Ark., has been incorporated with a capital of $100,000. The incorporators are J. T. Woodruff, president; J. E. Hollingsworth, vice president and general manager, and S. W. Portlock, secretary and treasurer.

The Ft. Dodge Gypsum Co., Ft. Dodge, Iowa, has been incorporated with a capital of $600,000 to manufacture gypsum products. The incorporators are W. E. Shearer, president; H. W. Blockson, vice president; L. B. Robbins, secretary, and H. W. Blockson, treasurer.

The Leathem D. Smith Stone Co., Sturgeon Bay, Wis., has been incorporated with a capital stock of $200,000 for the purpose of quarrying stone and maintaining yards for the distribution of stone and fuel. The incorporators are Leathem D. Smith, F. H. Behringer and H. M. Ferguson.

The Hastings Stone Co., Minneapolis, Minn., has been incorporated with a capital of $100,000 to manufacture stone into all the products for which it is adapted. The incorporators are C. R. Hazen, president; J. C. McCullough, vice president, and J. M. Hazen, secretary and treasurer.

The Columbus Gravel Co., Columbus, Miss., has been organized with a capital of $150,000. The pit will be at Greenville, Miss., and will consist of 300 acres of gravel and sand deposit. It is planned to erect a plant with a daily capacity of 75 cars. The incorporators are C. C. Kershaw, president; W. Brodnax, vice president; H. A. Porterfield, secretary; G. H. Davant, treasurer.

Wright & Co., Jasper, S. D., has leased a large tract of land near Garretson, S. D., and as soon as possible a crushing plant will be built.

Consolidated Sand & Supply Co., Ltd., Montreal, has been federally incorporated with a capital of $1,000,000, to mine, manufacture and prepare for market or deal in stone, sand, feldspar, kaolin, etc.

The Memorial Art Co., St. Cloud, Minn., has been incorporated with a capital of $50,000 for the purpose of manufacturing monuments, building stone and other stone products. The incorporators are R. D. Stroup, Naydine Stroup and C. R. Potthast.

Clark-Flanagan, Inc., Fair Haven, Vt., has been incorporated to take over the slate products business of Clark & Flanagan. The capital stock is $50,000, divided into 500 shares of $100 par each. The incorporators are John Flanagan, Fair Haven; Nathan P. Avery, Holyoke, Mass.; Katherine E. Clark, Northampton, Mass.; P. M. M. Phelps, Fair Haven, Vt.

The Hahn Muscatine Co., Muscatine, Iowa, has been incorporated with a capita of $250,000 to build a very modern gravel plant. The project is very new and as yet it is not known what method will be used to handle the material, but it is thought that a pump and hydraulic method will be used. The plant will be designed by the Link-Belt Co. H. B. Hahn is president of the company and Robert H. Grotefeld is vice president and general manager. The Chicago representative of the company is Hugh O'Neill, attorney, Conway Building. Mr. Hahn has been in the past an extensive cabbage grower and owns 1,000 acres of land at Muscatine. Mr. Grotefeld has been associated with Coyne Brothers, wholesale fruit and vegetable distributors of Chicago, Ill. The new plant is to be completed by Sept. 1 and will be as complete and up-to-date as it is possible to make a gravel plant, according to R. H. Grotefeld.

Phosphate

The Anaconda Copper Milling Co. plans to spend $750,000 improving phosphate beds near Hot Springs, Idaho.

The Farmers' Co-Operative Phosphate & Fertilizer Co., Mulberry, Fla., has been organized with $5,000,000 capital, L. N. Pipkin of Mulberry, president, and has purchased 3,700 acres of phosphate land in Polk and De Soto counties, estimated to contain nearly 10,000,000 tons of pebble phosphate rock averaging 65 to 75 per cent bone phosphate of lime. It has contracted to purchase additional lands estimated to contain from 4,000,000 to 5,000,000 tons. On the first tract there is located a phosphate plant which the company is improving to give an annual mining output of 50,000 tons. An additional plant with an annual capacity of 200,000 tons will be built, accompanied by a general town for the mine employes.

Hearing in the complaint case of the Harsh Phosphate Co., Nashville, Tenn., against the Nashville, Chattanooga & St. Louis Railway, in which the complainants are seeking to force the company to give them terminal shipping facilities before the Public Utilities Commission, has been completed and decision will be given soon. Miss Tennessee Lewis, bookkeeper and secretary to the president of the company, was the witness for the complainant. She testifid that when the plant was located at Easton, on the Lebanon branch of the N., C. & St. L. Ry., the terminal limit sign was some distance beyond the location of the plant. However, shortly after the plant was completed the terminal limit sign was moved and the complainant's plant was left outside the limit. This, Miss Lewis testified, did great injury to the company's business and they were unable to get switching facilities and thereby were unable to meet the competition of other plants in the same line of business. The railway company used witnesses in an effort to show that the terminal facilities were never extended that far and to show why the limit sign was placed at that location and later moved to its present location.

Manufacturers

A. C. Johnston, formerly chief engineer of the Chicago works, has been elected a vice president of the Link-Belt Co. and resident general manager of the Chicago plant. He succeeded Prentiss L. Coonley, who resigned to devote his time to the presidency of the Isko Mfg. Co.

The George Haiss Mfg. Co., 141st street and Rider avenue, New York, manufacturers of portable wagon loaders, have had plans prepared for a one-story plant, 50x188 ft., on Park avenue, near 141st street, to cost about $20,000. The building will be erected by the Haiss Realty Co. an associated organization.

At a recent meeting of the stockholders of the Franklin Moore Co., Winsted, Conn., manufacturers of hoisting machinery, the following directors were elected: J. B. Adams, president; W. A. Battey, vice president; W. C. Briggs, vice president; J. H. Whiting, treasurer; C. S. Moore, assistant treasurer; A. E. Moore, secretary, and G. W. Borton. The company, which was organized in 1866, for the manufacture of carriage bolts, has since developed an extensive line of hoisting apparatus, including chain blocks, hand cranes, trolleys, electric hoists and electric cranes.

"The Way to Increased Production" is the title of a new booklet just issued by the du Pont Chemical Co., Wilmington, Del., giving some facts in regard to their gigantic sale of war surplus material. The du Pont Chemical Co. took over the supplies and equipment of the war plants of the du Pont Company. General machinery of all kinds is on hand, and there is also special machinery built for manufacturing purposes peculiar to the powder business, but which can, in many instances, be used in other industries with slight changes. The du Pont Chemical Co. is now engaged in a national advertising campaign to sell these materials and the stocks are moving fast. The pamphlet ought to be a valuable handbook for buyers in every line in the present state of the market.

The Link-Belt Co., whose general offices are in Chicago, is carrying out an extensive program of expansion at its works in Chicago, Philadelphia, Indianapolis, Seattle and Toronto. New manufacturing facilities have been added to the several plants, and the personnel of both factories and sales offices has been increased. Two new furnaces, the seventh and eighth, have been added to the chain works at Indianapolis in the last few months. Announcement of the purchase by the Link-Belt Co. of the Fairmount Foundry at Philadelphia was made a few days ago by Charles Piez, president of the Link-Belt Co. This deal involved several hundred thousand dollars. The foundry will be used as an adjunct to the eastern works at Philadelphia, supplying this plant with gray iron castings. A new administration building is under construction at the Philadelphia works, and plans are being made to erect another such building at the Chicago works to make room for enlarged engineering, sales, drafting and clerical staffs.

The Federal Motor Truck Co. is the latest Detroit manufacturer to announce the purchase of a large tract of land to provide for future expansion. The Federal company's new plant will be located three blocks west of Grand River on the Detroit Terminal Railroad. It comprises 60 acres, is inside the city limits and just outside the six-mile circle. This is undoubtedly one of the largest single tracts to be devoted to the manufacture of motor trucks in Detroit, if not in the country, and it will give the Federal company facilities equal to any future need that may arise from a manufacturing standpoint. The property has a frontage of one-half mile on the Detroit Terminal Railroad, which will give direct connection with all the railroads in Detroit. All side tracks will enter factory buildings and loading and unloading will be done inside the plant. An administration building of modern design and completely equipped with restaurant, rest rooms and other modern features, will be erected entirely separate from the factory units. These latter will be of the one-story saw tooth type, so arranged that new units can be added as needed by expansion of the motor truck business.

Passed By The Screens

Personals

W. K. Hampton, 615 Pender street West, Vancouver, B. C., is the architect in charge of construction of the new $20,000 factory for the British Columbia Silica & Tile Co. The new buildings which are for crushing, grinding and refining will be located on Granville Island.

E. G. Lewis, formerly manager of the Cleveland office of the Bucyrus Co., has been appointed central sales manager of that concern, with headquarters at 622 McCormick Building, Chicago. He will succeed E. C. Hingston, who has resigned. The Cleveland office, which was opened by the company on Sept. 1, 1919, will be continued under Lewis' jurisdiction.

Pierce J. McAuliffe, consulting engineer, formerly of 55 Liberty street, New York City, announces that his future headquarters will be in the Whitehall Building, 17 Battery place, New York City. Mr. McAuliffe is a member of the American Society of Mechanical Engineers and the Society Naval Architects and Marine Engineers and does consulting work on design, construction and operation of sand and gravel plants, dredges and hydraulic excavating equipment.

Sand and Gravel

The Artesian Sand & Gravel Co., Yorkville, Ill., has given notice of dissolution.

The F. C. Peck & Son, Horatio, Ark., suffered a loss of $50,000 when fire destroyed its washing plant.

The Chagrin River Sand & Gravel Co., Aurora Station, Ohio, has decreased its capital from $100,000 to $1,000.

The Pioneer Sand Co., St. Joseph, Mo., is now working on raising its towboat, which was recently sunk. A wrecking boat from Kansas City is assisting in the work.

The Utah Sand & Gravel Co. has purchased the property of the Ryberg Bros., contractors at Salt Lake City, Utah, and is remodeling the sand and gravel plant to build up the commercial sand and gravel business of the district.

The new pumping plant of the Decatur Sand & Gravel Co., Decatur, Ill., formerly the Hydraulic Sand & Gravel Co., has been put in operation recently. From now on the plant is expected to be in full swing. The new owners have built a new flat boat and installed a 200-h.p. electrically driven pump. The old pumping plant which was put in by William Bowser was operated by a steam engine. After the plant burned a clam shell and cable were used for getting out the gravel. For several weeks the plant has not been operated at all because it was flooded by the high water. The new owners have bought 100 acres of ground, including the pit that has already been excavated.

E. R. Ernsberger, M. W. Ellis, W. B. Johnson, G. C. Blunt and Emil Rasier are named as the parties interested in the development of a gravel pit at Nilesville, Iowa. In a talk with Mr. Ernsberger he stated that equipment had been ordered for the gravel pit and would be shipped just as soon as the present railway strike situation had cleared up. Included in this equipment is a centrifugal pump which, with the power plant, will be placed on a barge out in the river. The pump has a capacity of 1,000 tons of gravel in ten hours. It is planned to work the equipment 24 hours a day, which would mean between 70 and 75 cars of gravel a day. Mr. Ernsberger has ordered 22 cars of the gondola type, for use in hauling gravel and approximately 1,000 feet of track will be laid by the Western Railroad to the point of operation. According to the highway commission there are only three or four other gravel pits of this kind in the state although there are a number of wagon pits. It is planned to incorporate the business in the near future.

The Freer Sand, Gravel & Brick Co., Detroit, Mich., has increased the capital from $65,000 to $100,000.

The Salem Sand and Gravel Co., Salem, Ore., reports that a $25,000 addition to its washing plant is now under construction.

The St. Paul Stone Co., Hastings, Minn., has purchased a 20-acre tract in southeast Hastings from R. F. Casley, the purchase price was given as $6,000. The company will open a stone quarry there.

The Diamond O Navigation Co., the Nickum & Kelly Sand & Gravel Co., the Columbus Digger Co., the Columbia Contract Co. and the Star Sand Co. were given the right by the state of Oregon to remove sand and gravel from the Willamette River between certain limits by paying the state a royalty of 10 cents per cu. yd. removed, with a minimum payment of 10,000 cu yds. per year.

The Elkhart Sand and Gravel Co., Elkhart Lake, Wis., which is the biggest shipper of construction material in Wisconsin, is sending a spring announcement to its customers. This consists of an attractive little eight-page folder, the title of which is, "The Sand Man's Awake to Your Needs." The announcement is not verbose, yet its character is one which does not require many words to convince the reader that this sand man is awake to its customers' needs. This company operates six large plants and specializes in storage facilities to enable the best of service to its customers.

The Moundsville Sand Co., Moundsville, W. Va., a corporation made up of Wheeling, W. Va., men, started operations in the sand beds of the old Compton Sand Co. The new company is incorporated at $25,000 and was recently granted a charter by Secretary of State Houston G. Young. It is composed of E. B. Evans, Alex Bolton, E. K. Dague, C. W. Carrothers and A. C. Smith. The sand beds are located on northern Western avenue and have been worked for many years by the Compton Sand Co. The property transfer includes a large acreage of untouched sand which the new company will begin to work immediately.

At a special meeting of the directors of the Morey Sand & Gravel Co., Eddyville, Iowa, Dan F. Morey tendered his resignation as president and director and stated that owing to his health it would not be possible for him to continue his present position nor give any attention to the management of the company. Mr. Wilson also tendered his resignation as a director, and upon proper action of the board both resignations were accepted. M. L. Blanton, who has been with the company in the capacity of engineer and general manager, was elected president, and H. H. Harrold and Frank Epperson were elected to the board of directors to fill the vacancy caused by the resignations.

Potash

American orders for $50,000,000 worth of German potash have been placed, according to newspaper reports from Berlin.

Some months ago the City of Los Angeles, Calif., put on the market the cement mill at Monolith, Calif., which it had built for making the cement used in the Los Angeles Aqueduct. However, it has been unable to sell or lease the plant for cement-making purposes, and the Board of Public Service has now leased it for a term of five years to be used for the production of potash. The city is to receive $22,500 per year rent, which is about 5 per cent of the minimum price placed on the plant by the city board.

The Eastern Potash Corporation has issued a circular letter to bondholders and stockholders of the Raritan Refining Corporation and its own stockholders announcing the beginning of an action against the Island Oil and Transport Corporation for $5,800,000 damages for alleged breach of contract. The action was started by the Raritan Refining Corporation in the Eastern District of Virginia following a dispute over a contract made in May, 1919. The letter states that both the Raritan Company and the Eastern Potash Corporation have made other arrangements to obtain their oil requirements.

Retail Dealers

The Waterford Dairy Co., Waterford, Wis., has been incorporated with a capital of $8,000 to deal in lime, cement, gravel, ice, fuel and brick.

C. A. Warrick, Peetz, Colo., has purchased a site for a cement block plant. One machine will be installed now and two more will be added in the fall.

The Independent Concrete Pipe Co., Ltd., Woodstock, Canada, has been incorporated for $200,000. A full line of pipe from 6 to 108 in. will be manufactured.

The Renn & Co., Kaukaunce, Wis., has been incorporated with a capital of $50,000 to deal in lime, cement, tile and concrete blocks. The incorporators are Peter Renn, John Renn and Emma Renn.

The Nelson Concrete Culvert Co. of Helena, Ark., was incorporated with a capital stock of $150,000. The corporators are: R. B. Campbell, F. N. Smith, L. W. Nelson, B. R. Thompson and E. P. Shapland.

South & Caven, Wilmington, N. Y., has been incorporated with a capital of $100,000 for the purpose of dealing in building material. The incorporators are T. L. Croteau, M. A. Bruce and S. E. Dill.

The Hygrade Builders' Supply Co., Brooklyn, N. Y., has been incorporated with a capital of $50,000 to deal in building material. The incorporators are J. Ragonetti, J. Grillo and V. Dibaia at 2467 85th street, Brooklyn.

The Paul J. Kalman Co., 22 West Monroe street, Chicago, has been incorporated with a capital of $100,000 to manufacture and deal in iron, steel and wood products, cement, granite, stone products and building material.

John Wardrop Brick & Tile Co., Ltd., Winnipeg, Man., has been incorporated by John Wardrop and others to manufacture and deal in brick, terra cotta, tile, sewer pipe, cement, lime, gravel, sand, stone, etc. The authorized capital is $100,000.

The New England Phosphate Co., Boston, Mass., has been incorporated with a capital of $50,000 to manufacture and deal in building materials. The directors are P. R. Allen, president; H. E. Sawyer, treasurer, and B. F. Copeland.

The Arkansas Lime Co., Ruddells, Ark., has purchased a steam shovel and a steam driven well drill. As soon as the drill arrives work will begin on drilling deep holes in the quarry face. The company expects to explode one big round of shots the middle of June, which will contain 7,000 lbs. of dynamite and which it is said will break 22,000 tons of stone. The stone will be loaded into the cars operating between the quarry and the kilns with the steam shovel. The new equipment was made necessary by the shortage of labor.

Lime

Fischer Lime and Cement Co., on Walnut Street, Memphis, Tenn., is beginning the erection of a large warehouse addition to its plant. It will be of steel and concrete with most modern equipment on the exterior and interior as well.

The St. Maurice Lime Co., situated at St. Louis de France, near the highway between Three Rivers and Shawinigan, will be increased by the addition of another kiln to the plant. The revival of the building trade has stimulated the demand for lime and the St. Maurice Lime Co. finds it difficult to fill all orders.

The Canada Cement Co., Montreal, Que., has appointed V. C. Moynes, Union Trust Building, Winnipeg, as its attorney for Manitoba to succeed W. O. Bovard. A report states that the company will resume the operation of its plant at Hull, Que., which has been idle all winter. Two hundred additional employes will be engaged there.

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Model 60 Marion Shovels, 2½-yard dippers, Nos. 1999, 2059

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1—8½ x 10 DC 2-D Lambert, with boiler

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1—Lidgerwood Cableway, 1164-ft. span, with 9 x 10" DC Reversible Link Motion Cableway Engine, 3-ton capacity

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1—14 x 20" standard gauge saddle tank Locomotive.

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Clam Shell Buckets

1—1½-yard Browning.

Cars

20—12-yard Western Air Dump, standard gauge, 26 ft. bed.

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Union Arcade **Pittsburgh, Pa.**

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FOR SALE

1—No. 7½ Austin Crusher, almost new.
1—Class "G" Duplex Air Compressor, capacity 925 F.P.M.
1—Class "H" Duplex Air Compressor, capacity 342 cu. ft. per min.
1—14 x 20 Atlas Plain Side Crank Steam Engine.
1—14 x 20 Russell Side Crank Steam Engine.
1—11 x 16 Side Crank Steam Engine.
1—Model "G" Marion Steam Shovel, good condition, low price.
1—17 x 24—4-4-0 American Passenger Locomotive.
1—10 x 16—36" gauge Vulcan Saddle Tank Locomotive. (Boiler needs overhauling.)
2—13-Ton Standard gauge Whitcomb Gasoline Locomotives.
1—10-Ton Superior Stone Grapple.
1—40" x 13' Revolving Screen.
1—Well Drill.

THE CASPARIS STONE CO.
Clinton Bldg., Columbus, Ohio

Standard Gauge Locomotives

1—15-ton four-driver saddle-tank Vulcan.
1—43-ton four-driver saddle-tank Vulcan.
1—40-ton 17x24" four-wheel switcher.
2—50-ton 18x24" six-wheel switchers.
2—14-ton 9x14"—36" gauge Vulcans.

Miscellaneous

1 Model 28 Marion traction shovel.
1—Monighan dragline, 125-ft. boom and 3-yd. bucket.
1—Bucyrus dragline, 60' 0" boom and 2-yd. bucket.
13—16-yd. dump cars.
40—60,000-lb. capacity flat cars.
1—Western standard gauge spreader.
2—1-yd. Foote side-discharge concrete mixers.
50-lb. and 56-lb. rail, ties, 1½-yd. clamshell bucket, 10-H.P. and 45-H.P. upright boilers, railway equipment, etc.

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Reg. drive, nickel steel shaft, fine condition. extra manganese mantle.
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9—150 H.P., 125 lb. H.R.T. Boilers, butt strap.
2—48"x12' Taylor Manganese Screens.
25—Air Compressors, 60 to 4,000 cu. ft.
1—9x8 Ingersoll-Rand steam.
1—427 cu. ft. Chicago pneumatic steam.
1—2400 cu. ft. Sullivan two stage.
1—95 H. P. Loco. type boiler, Illinois ship.
75—Steam and centrifugal pumps.
1—30-60 H.P. Emerson-Brantingham tractor.
1—No. 4 CRUSHING PLANT (A.C. motor drive). Concrete mixers—contractors' equipment.

Send us your inquiries for electrical equipment, engines, hoists, etc.

Ross Power Equipment Co., Indianapolis Indiana

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1—Gates No. 5 type "K" Gyratory Crusher, standard back drive, extra new pinion, chilled iron fitted, excellent condition. Also all sizes Jaw and Gyratory Crushers, all types, capacities Pulverizers.

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36—Practically brand new Kopple 1½-yard V-shape two-way 24" gauge dump cars—used less than one month.

12—same as above with brakes.

LOCOMOTIVES

3—Davenport 7½-ton 24" gauge steam locomotives.

Equipment Corporation of America
1405 Lumber Exchange Bldg.
CHICAGO, ILL.

New—RAILS—Relaying

All sections on hand for quick shipment. Reasonable prices quoted. Our stock is very complete.

M. K. FRANK
Frick Building Pittsburgh, Pa.

CLASSIFIED ADVERTISING

Rates for advertising in the Classified Department: $2.50 per column inch per insertion. Minimum charge, $2.50. Please send check with your order. These ads must be paid in advance of insertion.

Plants For Sale

FOR SALE, LEASE OR RENT

A fully equipped crushed rock and lime plant with highest testing blue limestone in southern Ohio, testing 94.20% Calcium Carbonate. Fine location for a large lime or cement plant. Fifty acres of a forty-foot ledge of stone with light stripping. Plant has been in operation for five years with increasing demands and good results. Am retiring from business on account of health. For further information, call on or address

FRANK SHARP
LYNCHBURG, - - - - - OHIO

Plants For Sale

CEMENT PLANT LOCATION

Inexhaustible deposits of tertiary soft limestone on rail and deep water transportation, less than 1% magnesia oxide, 80 to 95% lime carbonate, average 85%. Plenty of clay accessible. Convenient to trunk line coal carrying railroads. Center of territory requiring large quantities of cement for building and highway construction work.

H. J. Arrington, President

INDUSTRIAL LEAGUE
CLAREMONT, VA.

Miscellaneous

Your Prospective Customers
are listed in our Catalog of 99% guaranteed Mailing Lists. It also contains vital suggestions how to advertise and sell profitably by mail. Counts and prices given on 9000 different national Lists, covering all classes; for instance, Farmers, Noodle Mfrs., Hardware Dlrs., Zinc Mines, etc. *This valuable reference book free.* Write for it.

Send Them Sales Letters
You can produce sales or inquiries with personal letters. Many concerns all over U. S. are profitably using Sales Letters we write. Send for *free* instructive booklet, *"Value of Sales Letters."*

Ross-Gould Mailing Lists St. Louis

Help Wanted

WANTED

Experienced trap rock crushing plant operator. Plant consisting of 60" x 84" jaw crusher, nine gyratory crushers, electrically driven. Must have thorough knowledge of economical production for continuous operation. State age, experience, reference and salary wanted.

Box 1399 Care of Rock Products

WANTED

Mechanic to keep up crushing machinery at trap rock quarry. Must be thoroughly familiar with Gates crushers and not afraid of hard work. Permanent position for good man. Advise age, experience and salary expected. Address

Big Rock Stone & Construction Co.
111 Center Street, Little Rock, Arkansas

WANTED

Young man for assistant superintendent who has exceptional mechanical ability, familiar with the Raymond pulverizing system, capable of handling men with best results, able to give uniform capacity of plant by eliminating breakdowns to the minimum. Knowledge of operation that is essential for economical production, and upkeep of machinery. Submit references.

Address Box 1397, Care of Rock Products

Help Wanted

WANTED
GENERAL SUPERINTENDENT

For large quarry operation. Must be familiar with handling steam shovels, locomotives, large crushers, etc. State past experience, age and salary expected. Give references. Knowledge of heavy blasting and upkeep of all machinery to insure efficient and economical operation necessary. Must have Pep. Address

Box 1400 Care of Rock Products

Wanted

Young Superintendent for Lime Burning and Grinding Plant. Must understand machinery. Plant located in Massachusetts. Write giving full particulars, including salary. Address

Box 1402 Care of Rock Products

WANTED

Superintendent for modern Lime Plant, who has had all around experience in connection with Kilns, Hydrating Plant, Crushers, etc. References required. State age and experience.

Box 1403 Care of Rock Products

WANTED

Sales engineer experienced in quarry and crushing equipment, to sell our gyratory crusher line. Experience in laying out and selling essential.

AUSTIN MFG. COMPANY
Chicago, Ill.

Situation Wanted

SITUATION WANTED

Superintendent desires engagement where thorough knowledge of operation is essential for economical production; thorough knowledge of heavy blasting and efficient upkeep of machinery. References. Address

Box 1351 Care of Rock Products

¶ What you don't want someone else wants. And what you need someone else has to sell.

¶ State your needs or what you have to sell—in these columns. They pay!

Buyers' Guide of the Rock Products Industry

AIR COMPRESSORS
Worthington Pump & Mach. Co., New York City.

BAGS AND BAG MACHINERY
Bates Valve Bag Co., Chicago, Ill.
Jaite Company, The, Jaite, Ohio.
Valve Bag Co. of America, Toledo, Ohio.

BELTING
Cincinnati Rubber Mfg. Co., Cincinnati, Ohio.
Hettrick Mfg. Co., Toledo, Ohio.
Main Belting Co., Philadelphia, Pa.
New York Belting & Packing Co., New York City.
U. S. Rubber Co., New York City.

BELT FASTENERS
Crescent Belt Fastener Co., New York City.

BELT LACING
Crescent Belt Fastener Co., New York City.

BELT RIVETS
Crescent Belt Fastener Co., New York City.

BIN GATES
Beaumont Mfg. Co., Philadelphia, Pa.

BINS, STORAGE
Preston Co., J. M., Lansing, Mich.
Weller Mfg. Co., Chicago, Ill.

BLASTING SUPPLIES
Aetna Explosives Co., N. Y. City
Atlas Powder Co., Philadelphia, Pa.
Du Pont de Nemours & Co., E. I., Wilmington Del.
Grasselli Chemical Co., Cleveland, Ohio.

BUCKETS, ELEVATOR
Hendrick Mfg. Co., Carbondale, Pa.
Stephens-Adamson Mfg. Co., Aurora, Ill.

BUCKETS
Advance Eng. Co., Cleveland, O.
Browning Co., Cleveland, Ohio.
Marion Steam Shovel Co., Marion, Ohio.
McMyler Interstate Co., Cleveland, Ohio.
Owen Bucket Co., Cleveland, Ohio.

CALCINING MACHINERY
Atlas Car & Mfg. Co., Cleveland, Ohio.
Butterworth & Lowe, Grand Rapids, Mich.

CAR REPLACERS
Track Equipment Co., Huntington, W. Va.

CHAINS AND TRANSMITTING MACHINERY
Link-Belt Co., Chicago, Ill.
Stephens-Adamson Mfg. Co., Aurora, Ill.
U. S. Chain & Forging Co., Pittsburgh, Pa.

CHAINS, DREDGE
U. S. Chain & Forging Co., Pittsburgh, Pa.

CLIPS, WIRE ROPE
American Hoist & Derrick Co., St. Paul, Minn.

CONVEYORS AND ELEVATORS
Caldwell, H. W., & Son Co., Chicago, Ill.
Gifford-Wood Co., Hudson, N. Y.
Good Roads Mach. Co., Philadelphia, Pa.
Jeffrey Mfg. Co., The, Columbus, Ohio.
Link Belt Co., Chicago, Ill.
Portable Machinery Co., Passaic, N. J.
Robins Conveying Belt Co., New York City.
Smith Eng. Works, Milwaukee, Wis.
Stephens-Adamson Mfg. Co., Aurora, Ill.
Sturtevant Mill Co., Boston, Mass.
Universal Road Mach. Co., Kingston, N. Y.
Webster Mfg. Co., Tiffin, Ohio.
Weller Mfg. Co., Chicago, Ill.

CRANES
Locomotive Gantry
American Crane & Eng. Co., Toledo, Ohio.
American Hoist & Derrick Co., St. Paul, Minn.
Advance Eng. Co., Cleveland, O.
Ball Engine Co., Erie, Pa.
Browning Co., Cleveland, Ohio.
Byers Mach. Co., John F., Ravenna, Ohio
Chisholm-Moore Mfg. Co., Cleveland, Ohio.
McMyler-Interstate Co., Cleveland, Ohio.
Link-Belt Co., Chicago, Ill.
Ohio Locomotive Crane Co., Bucyrus, Ohio.
Osgood Co., The, Marion, Ohio.

CRUSHERS AND PULVERIZERS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Pulverizer Co., St. Louis, Mo.
Austin Mfg. Co., Chicago, Ill.
Bacon, Earle C., Inc., New York City.
Beaumont Mfg. Co., Philadelphia, Pa.
Buchanan Co., Inc., C. G., New York City.
Bradley Pulverizer Co., Allentown, Pa.
Butterworth & Lowe, Grand Rapids, Mich.
Chalmers & Williams, Chicago Heights, Ill.
Fuller-Lehigh Co., Fullerton, Pa.
Good Roads Mach. Co., Philadelphia, Pa.
Gruendler Pat. Crusher & Pulv. Co., St. Louis, Mo.
Jeffrey Mfg. Co., The, Columbus, Ohio.
K. B. Pulverizer Co., New York City.
Kennedy-Van Saun Mfg. & Eng. Corp., New York City.
Kent Mill Co., Brooklyn, N. Y.
Lewistown Fdry. & Mach. Co., Lewistown, Pa.
Marathon Mill & Machy. Works, Chicago, Ill.
McLanahan-Stone Mach. Co., Hollidaysburg, Pa.
Pennsylvania Crusher Co., Philadelphia, Pa.
Raymond Bros. Impact Pulverizer Co., Chicago, Ill.
Smidth & Co., F. L., New York City.
Smith Eng. Works, Milwaukee, Wis.
Sturtevant Mill Co., Boston, Mass.
Traylor Eng. & Mfg. Co., Allentown, Pa.
Universal Crusher Co., Cedar Rapids, Iowa.
Universal Road Mach. Co., Kingston, N. Y.
Webb City & Carterville F. & M. Works, Webb City, Mo.
Williams Pat. Crush. & Pulv. Co., Chicago, Ill.
Worthington Pump & Mach. Corp., New York City

DERRICKS
American Hoist & Derrick Co., St. Paul, Minn.

DRILLS
American Well Works, Aurora, Ill.
Sanderson Cyclone Drill Co., Orrville, Ohio.
Wood Drill Works, Paterson, N. J.

DRYERS
American Process Co., New York City.
Ruggles-Coles Eng. Co., N. Y. City.
Vulcan Iron Works, Wilkes-Barre, Pa.

DYNAMITE
Aetna Explosives Co., New York City.
Atlas Powder Co., Philadelphia, Pa.
Du Pont de Nemours & Co., E. I., Wilmington Del.

ENGINES, OIL & GAS
Worthington Pump & Mach. Co., New York City.

ENGINES, STEAM
Morris Mach. Works, Baldwinsville, N. Y.

ENGINEERS
Arnold & Weigel, Woodville, Ohio.
Bacon, Earle C., Inc., New York City.
Bradley Pulv. Co., Allentown, Pa.
Buckbee Co., J. C., Chicago, Ill.
Fuller Engineering Co., Allentown, Pa.
R. W. Hunt & Co., Chicago, Ill.
McAuliffe, P. J., N. Y. City
Smidth & Co., F. L., New York City.
Schaffer Eng. & Equip. Co., Pittsburgh, Pa.
Yates, Preston K., New York City.

EXCAVATORS
Ball Engine Co., Erie, Pa.
Green, L. P., Chicago, Ill.
Marion Steam Shovel Co., Marion, Ind.
Owen Bucket Co., Cleveland, Ohio.

EXCAVATORS
Dragline Cableway
Sauerman Bros., Chicago, Ill.

EXPLOSIVES
Aetna Explosives Co., New York City.
Atlas Powder Co., Philadelphia, Pa.
DuPont de Nemours & Co., E. I., Wilmington, Del.
Grasselli Chemical Co., Cleveland, Ohio.

FUSES
Ensign-Bickford Co., Simsbury, Conn.

GAS PRODUCERS
Chapman Eng. Co., Mt. Vernon, Ohio.
International Clay Mach. Co., Dayton, Ohio.

GEARS
Caldwell, H. W., & Sons Co., Chicago, Ill.
Stephens-Adamson Mfg. Co., Aurora, Ill.

GLASS SAND EQUIPMENT
Lewistown Fdy. & Mach. Co., Lewistown, Pa.

HOISTS
American Hoist & Derrick Co., St. Paul, Minn.
Chisholm-Moore Mfg. Co., Cleveland, Ohio.
Vulcan Iron Works, Wilkes-Barre, Pa.

HOSE
Water, Steam, Air Drill, Pneumatic Tool
Cincinnati Rubber Mfg. Co., Cincinnati, O.
N. Y. Belting & Packing Co., New York City.

HYDRATING MACHINERY
Atlas Car & Mfg. Co., Cleveland, Ohio.
Kritzer Co., The, Chicago, Ill.
Miscampbell, H., Duluth, Minn.
Schaffer Eng. & Equip. Co., Pittsburgh, Pa.

HYDRAULIC DREDGES
Morris Machine Works, Baldwinsville, N. Y.

INDUSTRIAL CARS
Atlas Car & Mfg. Co., Cleveland, Ohio.
Easton Car & Constr. Co., Easton, Pa.
International Clay Machine Co., Dayton, Ohio.
Koppel Indust. Car & Equip. Co., Koppel, Pa.
Watt Mining Car Wheel Co., Barnesville, Ohio.

LIME KILNS
Arnold & Weigel, Woodville, Ohio.
Steacy-Schmidt Mfg. Co., York, Pa.
Vulcan Iron Works, Wilkes-Barre, Pa.

LOADERS AND UNLOADERS
Ball Engine Co., Erie, Pa.
Gifford-Wood Co., Hudson, N. Y.
Good Roads Mach. Co., Philadelphia, Pa.
Green, L. P., Chicago, Ill.
International Clay Mach. Co., Dayton, O.
Jeffrey Mfg. Co., The, Columbus, Ohio.
Portable Mach. Co., Passaic, N. J.
Stephens-Adamson Mfg. Co., Aurora, Ill.

LOCOMOTIVES
Baldwin Locomotive Works, The, Philadelphia, Pa.
Fate-Root-Heath Co., Plymouth, Ohio.
Jeffrey Mfg. Co., The, Columbus, Ohio.
Lima Locomotive Works, New York City.
Porter Co., H. K., Pittsburgh, Pa.
Vulcan Iron Works, Wilkes-Barre, Pa.
Whitcomb Co., Geo. D., Rochelle, Ill.

MOTORS, ELECTRIC
Gifford-Wood Co., Hudson, N. Y.

MOTOR TRUCKS
Duplex Truck Co., Lansing, Mich.
Packard Motor Car Co., Detroit, Mich.
Pierce-Arrow Motor Car Co., Buffalo, N. Y.

PACKING
Sheet, Piston, Superheat, Hydraulic
Cincinnati Rubber Mfg. Co., Cincinnati, O.
N. Y. Belting & Packing Co., New York City.

PAINT AND COATINGS
Williams, C. K., & Co., Easton, Pa.

PERFORATED METALS
Chicago Perforating Co., Chicago, Ill.
Cross Eng. Co., Carbondale, Pa.
Hendrick Mfg. Co., Carbondale, Pa.
Johnston & Chapman Co., Chicago, Ill.
Nortmann Duffke Co., Milwaukee, Wis.

PLASTER MACHINERY
Butterworth & Lowe, Grand Rapids, Mich.
Ehrsam & Sons Co., J.B., Enterprise, Kan.

PORTABLE CONVEYORS
Stephens-Adamson Mfg. Co., Aurora, Ill.

PORTABLE STONE BINS
Austin Mfg. Co., Chicago, Ill.

PUMPS
American Well Works, Aurora, Ill.
Worthington Pump & Machine Co., N. Y. City.

PUMPS, SAND
K. C. Hay Press & Tractor Co., Kansas City, Mo.
Morris Mach. Works, Baldwinsville, N. Y.

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Caldwell, H. W., & Son. Co., Chicago, Ill.
Stephens-Adamson Mfg. Co., Aurora, Ill.
Weller Mfg. Co., Chicago, Ill.

POWDER
Aetna Explosives Co., New York City.
Atlas Powder Co., Philadelphia, Pa.
Du Pont de Nemours & Co., E. I., Wilmington Del.
Grasselli Chemical Co., Cleveland, Ohio.

PULVERIZED FUEL EQUIPMENT
Aero Pulv. Co., New York City.
Bradley Pulv. Co., Allentown, Pa.
Raymond Bros. Impact Pulv. Co., Chicago, Ill.

PUMP VALVES
N. Y. Belting & Packing Co., New York City.

QUARRY EQUIPMENT
Beaumont Mfg. Co., Philadelphia, Pa.
Marion Steam Shovel Co., Marion, O.
Universal Road Mach. Co., Kingston, N. Y.

SCRAPERS, DRAG
Green, L. P., Chicago, Ill.
Sauerman Bros., Chicago, Ill.

SCREENS
Austin Mfg. Co., Chicago, Ill.
Beaumont Mfg. Co., Philadelphia, Pa.
Cross Eng. Co., Carbondale, Pa.
Gifford-Wood Co., Hudson, N. Y.
Hendrick Mfg. Co., Carbondale, Pa.
Jeffrey Mfg. Co., The, Columbus, Ohio.
Johnston & Chapman Co., Chicago, Ill.
Link Belt Co., Chicago, Ill.
National Engineering Co., Chicago, Ill.
Smith Eng. Works, Milwaukee, Wis.
Stephens-Adamson Mfg. Co., Aurora, Ill.
Stimpson Equip. Co., Salt Lake City, Utah.
Sturtevant Mill Co., Boston, Mass.
Universal Road Mach. Co., Kingston, N. Y.

SCREENING
N. J. Wire Cloth Co., Trenton, N. J.

SEPARATORS
National Engineering Co., Chicago, Ill.
Raymond Bros. Impact Pulv. Co., Chicago, Ill.
Sturtevant Mill Co., Boston, Mass.

SEPARATORS, MAGNETIC
Buchanan Co., C. G., Inc., New York City.

SHEAVES
Mayer-Hasseldick Mfg. Co., St. Louis, Mo.

SHOVELS
Steam and Electric
Ball Engine Co., Erie, Pa.
Bucyrus Company, Milwaukee, Wis.
Marion Steam Shovel Co., Marion, Ohio.
The Osgood Co., Marion, Ohio.
Victor R. Browning & Co., Cleveland, Ohio.

STONE ELEVATORS
Austin Mfg. Co., Chicago, Ill.
Stephens-Adamson Mfg. Co., Aurora, Ill.
Weller Mfg. Co., Chicago, Ill.

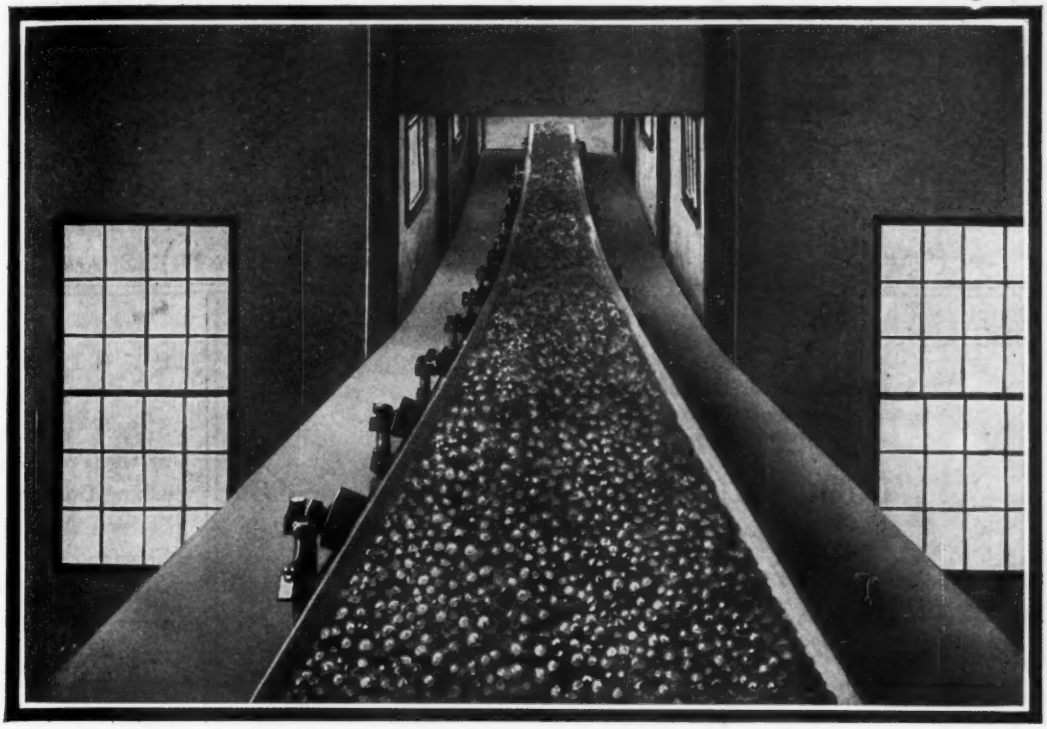
TANK CRAWLERS
Victor R. Browning & Co., Cleveland, Ohio.

TRACK EQUIPMENT
Central Switch & Frog Co., Cincinnati, Ohio.
Track Equipment Co., Huntington, W. Va.

WASHERS, SAND AND GRAVEL
Good Roads Mach. Co., Philadelphia, Pa.
Smith Eng. Works, Milwaukee, Wis.

WIRE ROPE
American Steel & Wire Co., Chicago, Ill.
Leschen, A., & Sons Co., St. Louis, Mo.
Waterbury Co., New York City.

WIRE CLOTH
Cleveland Wire Cloth Co., Cleveland, Ohio.
New Jersey Wire Cloth Co., Trenton, N. J.



Our Products Include:

Test Special Rubber Belting
Indestructible White Sheet Packing
Firo Superheat Sheet Packing
Cobbs High Pressure Piston Packing
Indestructible Steam Hose
Indestructible Pneumatic Tool Hose
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Your ton cost of conveying loose bulk materials is in direct ratio to the life of the belting used.

Therefore it pays to convey with Indestructible Conveyor Belting—it pays because Indestructible stands the stress of the toughest conveying job.

The extra strength built into the belt takes care of unusual strains with an ample margin of safety. The rubber cover affords secure protection against injury or wearing of the duck. Separation in the plies is guarded against by a tenacious friction strength.

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